The

Electrical Review

VOL. CIII. JULY 20, 1928. No. 2,643.

THE OLDEST ELECTRICAL PAPER. ESTABLISHED 1872.

Published every FRIDAY, Price 6d.

Chairman: H. ALABASTER.

Technical Editor: A. H. ALLEN, M.I.E.E. *Joint Managing Directors:* G. H. ALABASTER. E. A. GATEHOUSE M.I.E.E., A.M.INST.C.E. *Commercial Editor:* A. H. BRIDGE.

Manager and Secretary: E. S. MIDDLETON.

OFFICE: 4, LUDGATE HILL, LONDON, E.C.4.

Telegraphic Address "AGEEKAY, CENT., LONDON," Code, A B C. Telephone No.: Central 8871 (8 lines).

The "Electrical Review" is the recognised medium of the Electrical Trades, and has by far the Largest Circulation of any Electrical Industrial Paper in Great Britain.

SUBSCRIPTION RATES, Postage Free: United Kingdom, £1 14s 8d.; Canada, £1 12s. 6d. Colonial and Foreign, £2 1s. 6d. per annum. Cheques and Postal Orders (on Chief Office, London) to be made payable to THE ELECTRICAL REVIEW, LIMITED, and crossed "Midland Bank, Newgate Street Branch."

For List of Foreign Agents for the ELECTRICAL REVIEW see Advertisement Supplement.

Contents:

	PAGE
Artificial Sun-ray Treatment	89
Rural Electrical Development	90
"Trading without Tears"	90
Overhead Transmission Lines, by W. J. John (*illus.*)	91
High-Frequency Furnaces Operated by Motor-Generators (*illus.*)	94
Television, by T. Thorne Baker (*illus.*)	96
The Central Scotland Electricity Scheme, 1927 (*illus.*)	98
Constant Full-Load Distribution (*illus.*)	99
Legal	100
Parliamentary News	101
Business and Industrial Notes	102
Lighting and Power Notes	106
Tramway and Railway Notes	108
Telegraph and Telephone Notes	108
Radio Notes	109
Contract Information	109
Forthcoming Events	111
Notes	111
Institution Notes	113
Our Personal Column	114
Financial Section—	
New Companies Registered	114
Official Returns of Electrical Companies	115
Financial Section – *contd.*	
City Notes	116
Stocks and Shares	117
Our Foreign Electrical Trade	119
Electrical Contractors' Conference.—IV (*Illus.*)	120
Trading Without Tears: The E.C.A. Policy, by Howard Marryat	120
Concluding Address, by W. H. Walton	122
The Public Lighting Conference	123
Presidential Address, by J. F. Colquhoun	123
Automatic Control of Light, by Ernest E. Sharp	124
The Colliery and Mining Exhibition	126
The Royal Agricultural Show	127
Correspondence—	
Domestic Lighting and Heating and their Influence on Load Factor	129
Earthing and the Public	129
Small Circuit Breakers	129
Installation Costs	129
House-wiring Specifications	130
Past and Present Conditions of Jointing	130
Output, Load-factor and Efficiency	130
The L.C.C. Tramways	130
Published Specifications	131
Trade Mark Applications	131
New Work for Contractors	132

Artificial Sun-ray Treatment.

AT an inquest which was held at Shipley, Yorkshire, to inquire into the cause of death of a woman in hospital, a verdict of "death from ulceration of the stomach, due to burns from sun-ray treatment," was returned; the jury added a rider that the treatment had been administered with reasonable care and that there had been no negligence.

Whilst, on the one hand, the reported statement of Dr. J. P. Walker, who had attended the patient, that ultra-violet ray treatment must be carefully administered, the length of exposure of the body thereto and the distance of the latter from the lamp being important factors, will be generally accepted as correct: on the other hand, his opinion that death was due to ulceration of the stomach from burns on the back and left leg has been questioned, certain makers of u.v. lamps maintaining that it is quite impossible to cause such internal ulceration by an external application of ultra-violet light, irrespective of the duration of the patient's exposure to it, having regard to the shallow penetration of ultra-violet rays.

Dr. Mead, of the Bradford Children's Hospital, is said to have stated that the uniformity of the burns and their positions strongly suggested an overdose of ultra-violet rays, adding that "only people in good health should have the treatment." Similarly Dr. H. Tylford Howell, tuberculosis officer for Hackney and Bethnal Green, reporting to the general court of the Governors of the City of London Hospital for Diseases of the Heart and Lungs, is understood to have announced that artificial sunlight treatment had not yielded the results that the hospital had been led to expect, remarking that "Our experience is that the majority of our cases have benefited little, and in only one or two instances has definite improvement followed such treatment. Some indeed, were worse. The strong do well, but the weak become worse."

The good faith in which the statements quoted above were made is not questioned: they are, nevertheless, unfortunate, and their authors should appreciate the harm they may do. It is difficult to understand why "strong" people in "good health" should need treatment of any kind; it is true, of course, that not only "healthy" human

beings but also animals, birds, and plant life are stimulated by exposure to artificial sunlight and invigorated by ultra-violet radiation, but equally common is the knowledge that such treatment is being beneficially administered to patients suffering from various diseases while they are in a weak state, provided that it is carried out under competent medical supervision without fatigue and that the diet of the patient is suitably regulated meanwhile. Of course, careless or prolonged exposure to artificial sunlight will produce severe sunburn and blistering of the skin, while some authorities contend that acute ulceration of the stomach, particularly of the duodenum, has been known to result from burns and scalds of the skin, however caused, probably due to septic infection from the wound. Thus, if harm should result, it would be caused by the *burn*, any form of heat being capable of producing similar symptoms, and not by the u.v. radiation *per se*.

Obviously ultra-violet treatment cannot be claimed to be a cure for all diseases, or even beneficial in every case without exception, for one man's meat not infrequently proves to be another's poison; however, reference may be made to a report on an artificial sunlight clinic at the Sherwood Colliery at Mansfield, in Nottinghamshire, which reveals the fact that 50 boys who were submitted to a three months' course of treatment from December, 1927, to February, 1928, showed an average increase in weight of 4 lb. 6.28 oz. and of 0.762 in. in height, compared with an average development amongst 50 boys who were not treated of 2 lb. 10.24 oz. and 0.5 in., respectively; the boys' dietary, which was deficient in vitamins and mineral salts, was unchanged. The treated boys, it is stated, showed a marked air of brightness and cheerfulness, compared with the others, and they declared that their appetite had improved and that their work seemed easier. The experiment was conducted under the auspices of the New Health Society and the Sunlight League by a committee of which Sir Bruce Bruce-Porter was chairman and Dr. C. W. Saleeby a member, and it recommended the establishment of similar clinics in industrial centres.

Every innovation must have its critics as well as its adherents: a good deal has still to be learned about artificial sunlight, or ultra-violet radiation, and the methods of its use, and meanwhile it behoves all concerned to guard against either overstating the benefits that may be derived from, or publicly expressing hastily formed opinions which may condemn, means of treating disease that may be of paramount importance to the national welfare. It should be borne in mind that ultra-violet radiation has been in constant use for therapeutic purposes for over 20 years—the Finsen lamp being the first important and effective source—and that in all that time no ill effects have been reported as experienced by any of the operators and attendants who have administered the treatment; there is, therefore, no evidence that the tragic results of excessive exposure to X-rays will find a parallel in the case of ultra-violet radiation, and the low intensity of the rays evolved by the types of apparatus commonly sold to the public for home treatment is a safeguard against injurious effects.

Rural Electrical Development.

WHEN the time comes for the "grid" to extend its transmission arms, directly or indirectly, to the remoter parts of the country, many interesting questions will arise; one is the economy of the small central station *versus* bulk supply, and in many places it is difficult to see how a satisfactory case can be made for the latter. Indeed, under the existing system the matter has been put to the test in some instances with results decidedly in favour of the small central station, particularly where internal-combustion engines are employed.

But whether or not these small districts are to come on the "grid," the important and urgent thing at present is that development should proceed unhampered, and in this connection a warning is not out of place. There is no doubt that one result of the publicity given to the 1926 Electricity (Supply) Bill by its political sponsors, before and during its passage through Parliament, has been to create in the public mind, particularly in the rural areas, the false impression that all that is necessary is to sit down and wait for the "cheap electricity." The effects of such an attitude of mind become really serious when that idea creeps into the minds of local electricity committees. We have recently heard of a number of places where this seems to have happened, with the result that the necessary "push" so vital to the industry at present is not being applied.

It is not sufficient merely to blame the backward local undertakings for lassitude and lack of enterprise. Pressure should be brought to bear on them to make them realise that development is their responsibility, and the "wait-and-see" idea should be stamped out. But are the engineers themselves altogether without reproach? A good chief convinces his committee that a progressive policy is the only right policy to pursue. Of course, all engineers realise that the electricity supply industry is not the place for the "comfortable-little-job" kind of man; what is wanted at the head of an undertaking is a "live wire." The success of the concern will depend wholly upon the business-getting ability of the manager and his staff, and it must be the right kind of business—that which fills up the valleys in the load curve. Now, a load of that kind can be handled without increase of maximum demand and therefore without additional plant, and if a small undertaking is not permitted to carry out extensions of plant, in view of its being destined to receive a bulk supply from the "grid," the incentive to improve the load factor is all the greater. That is the plain duty of the engineer and his board or committee, as the case may be, for electricity supply is a public service, in which there is no place for *laissez faire*. Initiative and enterprise are the qualities demanded.

"Trading Without Tears."

IN this issue we conclude our report of the proceedings at the Cheltenham Conference of the Electrical Contractors' Association with an abstract of Mr. Marryat's paper on "Trading Without Tears," together with the discussion upon it. However prosperous the industry appears to those outside, those inside will certainly agree with Mr. Marryat that things are not as they should be. The industry is doubtless flourishing in the sense that there is plenty of work and good prospects of more, but in spite of that the profits are, generally speaking, incommensurate with the capital and labour involved. Mr. Marryat sets out to explain why such a condition exists, and in doing so distributes the blame impartially between manufacturers, wholesalers and retailers. He partly excuses the last class, however, by attributing their lack of enterprise to a lack of certainty engendered by the methods of the other two classes. In other words, while the manufacturer goes behind the backs of both wholesaler and retailer to the general public, and the wholesaler behind the retailer's back, the retailer has to deal with as much of the general public as the manufacturer and wholesaler leave him.

While it might appear that it is to the public's advantage to go straight to the manufacturer, or wholesaler, if it can, this is not really the case, Mr. Marryat says. If each body confined itself to its particular job, selling would be far more efficient, leading to more economical production, and the public would be better off.

It is the contractors' task to convince the rest of the industry that their Trading Policy is not merely a scheme to benefit themselves, but that it is a means of extricating the business from the muddle in which it finds itself.

Overhead Transmission Lines.

The author puts forward a method of calculating the sag of overhead transmission lines which has given satisfaction in many cases.

By W. J. JOHN, A.R.C.Sc., A.M.I.E.E.

MANY articles have been written on the subject of sag calculations, and as an excuse for still another the writer can say that he has read most of the articles, used the methods outlined, but liked none of them. While it is probably true that the writer's dislike of these methods is peculiar to himself, and that other engineers are quite satisfied with them, it can be claimed that the method now to be described has been used with every satisfaction for making some hundreds of sag calculations.

For any given line the material of which the conductors are made is known, and therefore all its physical constants are also known. Those essential to sag calculations are Young's modulus (E), the temperature coefficient (K) and the ultimate tensile strength of the conductor. The size of the wire and its construction (solid or stranded) will also be known, as well as the span length. Having this knowledge, the problem of sag calculation may be expressed thus:—The load per unit length of conductor, and the sag at a certain temperature being known, calculate the sag at any other temperature and under any other loading per unit length. Or, in other words, the sag being known under a certain set of initial conditions, the problem is to calculate the sag under a different set of conditions.

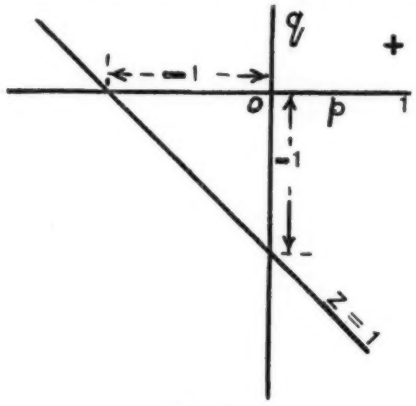


Fig. 1.

We may thus refer to "initial conditions" and "final conditions." In practice usually, but not always, the initial set of conditions corresponds to the maximum load on the conductor and a low temperature, while the final conditions are the dead weight of the conductor and a high temperature.

The fundamental formula for sag determinations is:

$$D_t^3 + \frac{L^2}{64}\left\{\frac{24\,T_o}{Ea} - \frac{L^2 W_o^2}{T_o^2} - 24\,Kt\right\} D_t - \frac{3L^4 W_t}{64\,Ea} = 0$$

in which the suffix t denotes the final conditions; the suffix o the initial conditions; D_t, the final sag (in feet); T_o, initial tension in conductor (in lb.); W_o, initial loading on conductor in lb. per foot run; t, temperature change from initial to final conditions; W_t, the final loading on conductor in lb. per foot run; K, temperature coefficient of conductor; L, span length (in ft.); E, Young's modulus; and a, area of conductor in square inches.

The solution of this cubic may be obtained graphically thus:—

Consider a general equation in z^3 and z:—

$$z^3 + pz + q = 0.$$

By comparison with the above equation we have:—

$$p = \left[(24\,T_o/Ea) - (L^2 W_o^2/T_o^2) - 24\,Kt\right] \times L^2/64.$$

$$q = 3\,L^4 W_t/(64\,Ea) \text{ and } z = D_t = \text{sag}.$$

A set of curves can be constructed giving the relation between p and q for different values of z; *e.g.*, when $z=1$ the equation becomes $1+p+q=0$, *i.e.*, $p+q=-1$; when $p=0$, $q=-1$; and when $q=0$, $p=-1$. Hence, for this value of z the relation between p and q is the straight line given in fig. 1.

In the same way the straight lines which express the relation between p and q for other values of z may be obtained. Fig. 2 shows a set of such lines which are constructed from the values given in Table I.

TABLE I.

z	Relation between p and q.	Value of p when $q=0$.	Value of q when $p=0$.
0.1	$0.001+0.1p+q=0$	-0.01	-0.001
0.2	$0.008+0.2p+q=0$	-0.04	-0.008
0.3	$0.027+0.3p+q=0$	-0.09	-0.027
0.4	$0.064+0.4p+q=0$	-0.16	-0.064
0.5	$0.125+0.5p+q=0$	-0.25	-0.125
0.6	$0.216+0.6p+q=0$	-0.36	-0.216
0.7	$0.343+0.7p+q=0$	-0.49	-0.343
0.8	$0.512+0.8p+q=0$	-0.64	-0.512
0.9	$0.729+0.9p+q=0$	-0.81	-0.729
1.0	$1 + p+q=0$	-1.0	-1.0

If on account of the small values of p and q it is difficult to plot the p and q line from the value of p when $q=0$, and of q when $p=0$, then any other two more convenient points may be substituted, *e.g.*, in the above table when $z=0.1$ the line must be constructed to pass through the points (-0.01 and 0) and (0 and -0.001) which is difficult to do with accuracy. The lines may, however, be easily drawn thus:—

When $p=1$ then $0.001+0.1p+q=0$ becomes $0.001+0.1+q=0$ and $q=-0.101$. When $p=-1$, then $0.001-0.1+q=0$, and $q=+0.999$. The line therefore passes through (1 and -0.101) and (-1 and $+0.099$) which with sufficient accuracy is (1 and -0.1) and (-1 and $+0.1$). Now if when we work out our sag equations we find $p=+0.5$ and $q=-0.3$, then to get the value of z which satisfies the equation it is merely necessary to plot on fig. 2 the point whose ordinates are (0.5 and -0.3). This falls between the $z=0.4$ and the $z=0.5$ lines and to get the value of z accurately further lines for $z=0.41$, 0.42, &c., should be drawn. If this is done it will be found that the value of z is 0.43. In this way the sag may be found for any values of p and q which lie between plus and minus 1.

It is, of course, probable that when p and q are calculated it will be found that their values do not lie between $+1$ and -1. It will still be possible, however, to use fig. 2 by the following simple expedient:—

Find a number b, say, of such value that when p is divided by b^2 and q by b^3 the quotient is less than 1 in each case. Thus the original equation is $z^2+pz+q=0$. If p or q or both p and q are greater than 1, find a number b such that in the equation $z_1^3+pz_1/b^2+q/b^3=0$ the values of p/b^2 and q/b^3 are each less than 1. Obtain the solution for z_1 from fig. 2: the value of the sag z will be b times the value of z_1 thus obtained.

EXAMPLE No. 1.—*Overhead conductor loaded to Indian Regulations, viz*:—

Maximum loading to be taken as being produced by a wind pressure of 25 lb. per sq. ft. on 0.6 of the conductor diameter. No ice loading. The maximum loading to the taken at a temperature of 22 deg. F. Factor of safety under maximum load = 3. Conductor is solid copper 0.035 sq. in. area, 0.24 in. diameter. Calcu-

late the sag in still air at 122 deg. F. if under the maximum loading the conductor is to be stressed to the maximum permissible tension. Span length = 250 ft., and wind pressure per foot = 0.02 × 0.6 × 25 = 0.3 lb. Weight of conductor per foot = 0.138 lb.

Total maximum load on conductor = $\sqrt{0.3^2 + 0.138^2}$ = 0.33 lb. per foot. Take the ultimate strength of conductor as 60,000 lb. per sq. in., then the maximum working stress (f.s. = 3) = 20,000 lb. per sq. in.

Hence the maximum working pull = 20,000 × 0.035 = 700 lb., and the sag at the maximum load = $0.33 \times 250^2/(8 \times 700) = 3.683$ feet.

The initial conditions are $w_o = 0.33$, $T_o = 700$ and $\theta_o = 22°$ F.; and the final conditions, $w_t = 0.138$, T_t (or D_t) = ? and $\theta_t = 122°$ F.

Hence, $t = 122 - 22 = +100°$ F., E for copper = 18×10^6, and K for copper = 9.45×10^{-6}; then

$(L^2/64) \times (24\ T_o/Ea) = (250^2/64) \times 24 \times 700/(18 \times 10^6 \times 0.035) = 26.1.$

$(L^4/64) \times (w_o^2/T_o^2) = (250^4/64) \times (0.33^2/700^2) = 13.52.$

$(L^2/64) \times 24\ Kt = (250^2/64) \times 24 \times 9.45 \times 10^{-6} \times 100 = 21.84.$

$\therefore p = 26.1 - 13.52 - 21.84 = -9.26.$

$q = -3 \times L^4 w_t/(64\ Ea) = -3 \times 250^4 \times 0.138/(64 \times 18 \times 10^6 \times 0.035) = -40.1.$

Hence $z^3 - 9.26\ z - 40.1 = 0$

Try $b = 4$, so that $z_1^3 - 0.578\ z_1 - 0.628 = 0$.

$z_1 = 1.075$ (from fig. 2)

$z = 4.3$ feet.

Hence the sag in still air at 122 deg. F. = 4.3 ft.

EXAMPLE No. 2.—*Calculation of steel earth wire to give same sag as the copper power conductors under stated conditions*:—Assume that a 7/16 galvanised-steel earth wire is used with the power conductors dealt with in the first example, and the earth wire is arranged to have the same sag as the power conductor at 72 deg. F. in still air. What will be the pull in the earth wire at 22 deg. F. under maximum load conditions?

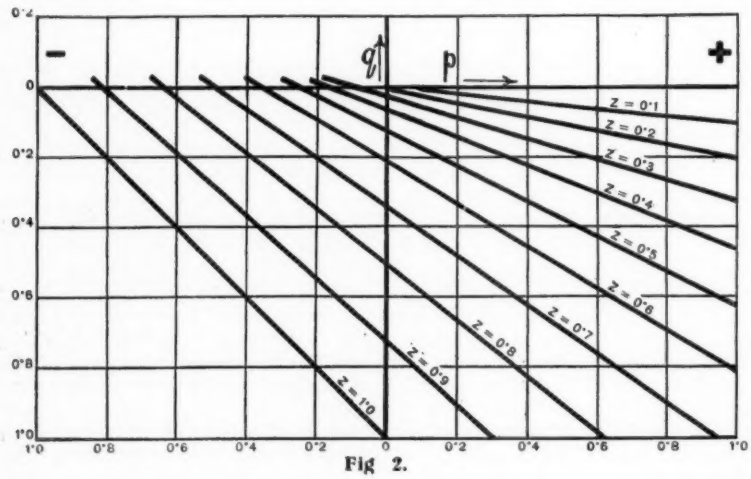


Fig 2.

The first problem is to calculate the sag of the power conductor in still air at 72 deg. F. instead of 122 deg. F. The only quantity which has changed is $(L^2/64) \times 24\ Kt$, which is now 10.92 instead of 21.04.

p will now be $26.1 - 13.52 - 10.92 = +1.66$.

q (as before) $= -40.1$,

$\therefore z^3 + 1.66\ z - 40.1 = 0$.

Try $b = 4$, so that $z_1^3 + 0.104\ z_1 - 0.628 = 0$

$z_1 = 0.77$, and $z = 3.08$ feet

i.e., the sag of the power conductor in still air at 72 deg. F. is 3.08 ft.

For the earth-wire calculations we have 7/16 galvanised steel of diameter = 0.192 in., area = 0.022 sq. in. Wind pressure per foot = $(0.192 \times 0.6 \times 25) \div 12 = 0.24$ lb. Weight per foot = 0.078 lb.

Resultant loading = $\sqrt{(0.24^2 + 0.078^2)}$ = 0.26 lb. per foot.

The initial conditions are that in still air at a temperature at 72 deg. F. and a loading of 0.078 lb. per foot the sag is 3.08 ft., corresponding to a pull of $0.078 \times 250^2/(8 \times 3.08) = 253$ lb. The final conditions are a loading of 0.266 lb. per ft., a temperature of 22 deg. F. and an unknown sag and corresponding pull.

The initial conditions are $w_o = 0.078$, $T_o = 253$ lb. and $\theta_o = 72°$ F.; and the final conditions $w_t = 0.26$, $T_t = ?$, and $\theta_t = 22°$ F.

Note that in this case $t = -50°$ F., $E = 30 \times 10^6$, and $K = 6.4 \times 10^{-6}$.

$(L^2/64) \times (24\ T_o/Ea) = (250^2/64) \times 24 \times 253/(30 \times 10^6 \times 0.022) = 8.982.$

$(L^4/64) \times (w_o^2/T_o^2) = (250^4/64) \times (0.078^2/253^2) = 5.799.$

$(L^2/64) \times 24Kt = (250^2/64) \times 24 \times 6.4 \times 10^{-6} \times -50 = -7.499.$

$p = 8.982 - 5.799 + 7.499 = 10.682.$

$q = -3L^4\ w_t/(64Ea) = -3 \times 250^4 + 0.26/(64 \times 30 \times 10^6 \times 0.022) = -72.11.$

$\therefore z^3 + 10.682\ z - 72.11 = 0.$

Try $b = 5$, so that $z_1^3 + 0.4273\ z_1 - 0.577 = 0$.

$z_1 = 0.67$ (from fig. 2)

$z = 3.35$ feet.

Hence the sag at 22 deg. F. under maximum load is 3.35 ft.

Pull corresponding to this sag = $0.26 \times 250^2/(8 \times 3.35) = 610$ lb.

Tension = 610/0.022 = 27,700 lb per sq. in.

= 12 tons per sq. in.

If steel having an ultimate tensile strength of 40 tons per sq. in. is used, a factor of safety = 3.3 will result.

EXAMPLE No. 3.—As a further example consider a case which is of fairly frequent occurrence in practice, especially for low-voltage distribution schemes. The conductor used for such schemes is frequently of large section, and if designed to be fully strained the terminal poles may require to be provided with many stays in order to give them the required strength. It will be frequently found more economical to "let the conductor out," that is, deliberately make the sag greater than it need be from the point of view of mechanical strength, in order to relieve the load on the terminal poles. The saving in stays will frequently more than compensate for the extra cost involved in an increase in height of the intermediate poles.

The problem may be stated thus:—Having given the initial sag of the conductor in still air at the highest operating temperature, calculate the tension in the conductor under maximum loading and at the lowest operating temperature. The solution of the problem can be best embodied in curves similar to that shown in fig. 3, for a No. 3 s.w.g. solid copper conductor, the loadings being in accordance with El. C. 39* for low-voltage circuits, *viz.*, ½ in. ice and simultaneous wind pressure of 8 lb. per sq. ft. In fig. 3 the *maximum* pulls in the conductor for various initial assumed sags in still air and at 122 deg. F. are plotted. Thus, taking the 100-ft. span, if the initial sag is made 4 ft., the maximum load to be taken by the terminal poles is 200 lb. If the initial sag is made 2 ft., then the terminal poles must be made strong enough to withstand a pull of 530 lb., and so on. Of course, no initial sag must be taken which will give a greater pull in the conductor than is permissible, having regard for its ultimate strength and the desired factor of safety. Curves such as that given in fig. 3, give the data required for the fixing of the height of the intermediate poles and for the fixing of the strength of the terminal poles. The initial "still air sag" which will be chosen is that which gives a minimum *total* outlay on

* Regulations for overhead lines prescribed by the Electricity Commissioners. Since this article was prepared El. C. 39 has been superseded by El. C. 53 and El. C. 53a.

all the poles. The method used in calculating the curves of fig. 3 will now be explained.

Take a No. 3 s.w.g. solid-copper conductor: the diameter = 0.252 in., area = 0.0499 sq in., and weight per foot = 0.192 lb.

The maximum working pull (f.s. = 2) = 12 × 2,240 × 0.499 = 1,340 lb. With ½ in. ice loading, weight of ice per foot = 0.155 lb.

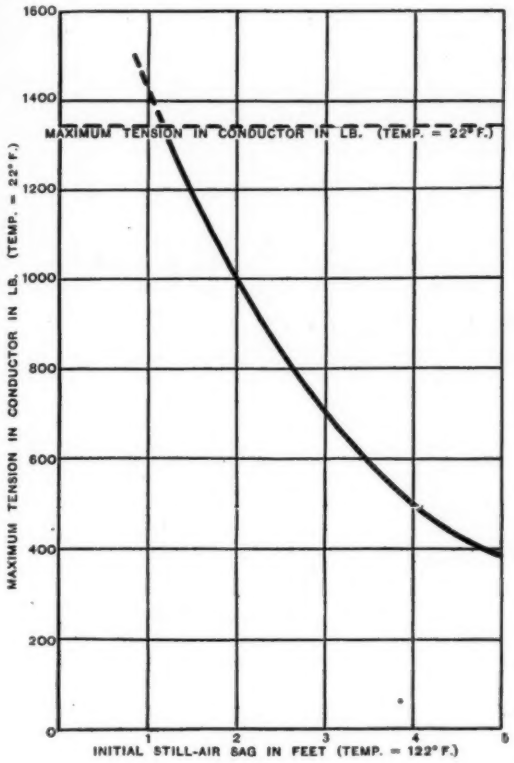


Fig. 3.

Total vertical load per foot = 0.347 lb.

Wind load per foot = 0.752 × 8/12 = 0.501 lb.

Resultant load per foot = $\sqrt{0.347^2 + 0.501^2}$ = 0.608 lb.

For a 150-ft. span, if the initial sag in still air is arranged to be 1 ft., the initial conditions are w_o = 0.192, T_o = 0.192 × 150²/8 × 1 = 540 lb. and t = 0° F., and the final conditions w_t = 0.608, T_t = ?, and t = −100° F.

$(L^2/64) \times (24\,T_o/Ea) = (150^2/64) \times 24 \times 540/(18 \times 10^6 \times 0.0499) = 5.072.$

$(L^4/64) \times (w_o^2/T_o^2) = (150^4/64) \times (0.192^2/540^2) = 1.000.$

$(L^2/64) \times 24\alpha t = -(150^2/64) \times 24 \times 0.000945 = -7.931.$

$p = 5.072 - 1 + 7.931 = 12.003,$

$q = -3 \times 150^4 \times 0.608/(64 \times 18 \times 10^6 \times 0.0499) = -16.06,$

$\therefore z^3 + 12.003\,z - 16.06 = 0.$

Try $b = 4$, so that $z_1^3 + 0.75\,z_1 - 0.251 = 0.$

$z_1 = 0.3.$

$z = 1.2$ feet.

$T_t = 0.608 \times 150^2/(8 \times 1.2) = 1{,}430$ lb.

(Since the maximum permissible load is 1,340 lb., an initial sag of 1 ft. will not be permissible.)

If the calculations are repeated for various other assumed initial sags results will be obtained as in Table II (which are plotted in fig. 3).

TABLE II.

No. 3 s.w.g. 150-ft. span.

Initial still-air sag in feet	1	2	3	4	5
Max. pull in lb.	1,430	1,000	700	500	383

Table III gives the results of similar calculations made on No. 0 and No. 10 s.w.g. solid copper conductors for span lengths of 100 and 150 ft.

TABLE III.

100-ft. span.

Initial still-air sag, ft. ...	1	2	3	4	5
Maximum pull in pounds — No. 0 s.w.g.	1,540	695	—	—	200
Maximum pull in pounds — No. 3 s.w.g.	1,000	525	298	209	162
Maximum pull in pounds — No. 10 s.w.g.	363	269	197	148	117

150-ft. span.

Initial still-air sag, ft. ...	1	2	3	4	5
Maximum pull in pounds. — No. 0 s.w.g.	2,270	1,500	—	—	477
Maximum pull in pounds. — No. 3 s.w.g.	1,430	1,000	700	500	383
Maximum pull in pounds. — No. 10 s.w.g.	508	423	362	302	252

EXAMPLE No. 4.—*Auxiliary cable supported from steel earth wire*:—

As a final example consider the case of an auxiliary cable supported from a steel supporting wire by suspenders at frequent intervals, fig. 4.

The loading conditions will be assumed to be the British standard for high-voltage lines as given in El. C. 39, *viz.*, ½-in. thickness of ice and simultaneous wind load of 8 lb. per sq. ft. on the ice-laden conductor. The particulars for steel wire and auxiliary cable are thus:—

	Steel supporting wire.	Auxiliary cable.
Size	7/8	—
Diameter, bare.	0.48″	0.82″
Diameter, ice-covered. ...	1.48″	1.82″
Weight per foot in lb. ...	0.486	1.00
Weight of suspenders per foot in lb. ...	—	0.062
Weight of ice per foot in lb.	0.608	
0.818 + 10% for suspenders, say, 0.90.		
Wind load per foot in lb.	0.987	
1.215 + 10% for suspenders, say, 1.34.		

The sectional area of the steel is 0.1407 sq. in. and its ultimate tensile strength 45 tons per sq. in.

Taking a factor of safety of 2 and a stranding factor of 0.92, the maximum working tension in the steel is 0.92 × 2,240 × 45/2 = 46,400 lb. per sq. in. Maximum working load = 46,400 × 0.1407 = 6,530 lb. = T_o.

The loading conditions will be as illustrated in fig. 5, where the vertical forces are the weight of conductor plus the weight of ice per foot, and the horizontal forces are the total wind loads on the ice-laden conductors per foot.

The total load taken by the steel wire will be a vertical force of 1.094 + 1.962 = 3.056 lb., and a horizontal force of 0.987 + 1.34 = 2.327 lb. The maximum resultant load on the steel wire is therefore

$\sqrt{(3.056^2 + 2.327^2)} = 3.84$ lb. per foot = w_o.

The initial temperature being assumed as 22 deg. F., the initial conditions are now fixed as

$w_o = 3.84$, $T_o = 6{,}530$, and $\theta_o = 22°$ F.

The problem is to calculate the sag in still air at a temperature of 122 deg. F., the span length considered being 300 feet.

In still air the only loads will be the weights of the

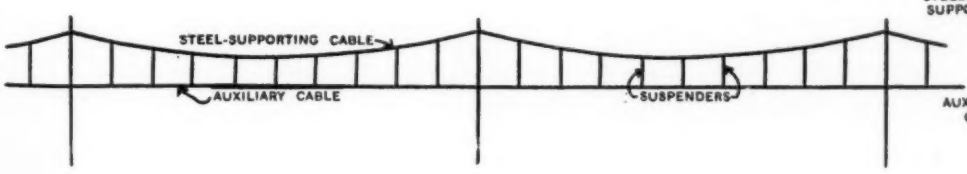


Fig. 4.

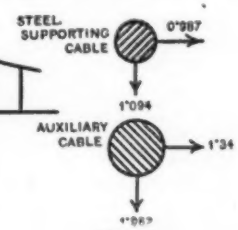


Fig. 5.

various parts, *viz.*, $0.486 + 1.00 + 0.062 = 1.548$ lb. per foot. The final conditions will therefore be

$$w_t = 1.548,\ \tau_t = 1,\ \text{and}\ \theta_t = 122^\circ\ \text{F.}$$

The solution may now be obtained in the usual manner:—

The initial conditions are $w_o = 3.84$, $\tau_o = 6{,}530$ lb., and $\theta_o = 22^\circ$ F.; and the final conditions, $w_t = 1.548$, $\tau_t = 1$, and $\theta_t = 122^\circ$ F.

In this case $t = 122 - 22 = 100$, $E = 30 \times 10^6$, and $K = 6.4 \times 10^{-6}$. For a 300-ft. span—

$$(L^3/64) \times (24\ \tau_o/Ea) = (300^3/64) \times 24 \times 6{,}530/(30 \times 10^6 \times 0.1407) = 52.22.$$

$$(L^4/64) \times (w_o^2/\tau_o^2) = (300^4/64) \times (3.84^2/6{,}530)^2 = 43.75.$$

$$(L^2/64) \times 24Kt = (300^2/64) \times 24 \times 6.4 \times 10^{-6} \times 100 = 21.6.$$

$$p = 52.22 - 43.75 - 21.6 = 52.22 - 65.35 = -13.13.$$

$$q = -3\ L^4 w_t/(64\ Ea) = -3 \times 300^4 \times 1.548/(64 \times 30 \times 10^6 \times 0.1407) = -139.3.$$

$$\therefore z^3 - 13.13\ z - 139.3 = 0.$$

Try $b = 6$ so that $z_1^3 - 0.366\ z^1 - 0.645 = 0$.

$$z_1 = 1.005,\ \text{and}\ z = 6.03\ \text{feet.}$$

Thus the sag in still air at a temperature of 122 deg. F. will be 6.03 ft., and the corresponding load in the steel wire $\tau_t = 1.548 \times 300^2/(8 \times 6.03) = 2{,}900$ lb., giving a stress of 9.2 tons per sq. in.

High-Frequency Furnaces Operated by Motor-Generators.

A Review of the Advantages and Prospects of the System.

(COMMUNICATED)

THE use of high-frequency current in metallurgy is now rapidly developing from its early stage, in which it was more or less confined to research work and the melting of precious metals and some carbon-free alloys. High-frequency furnaces—by which are meant ironless induction furnaces using frequencies higher than those of the ordinary power supply—are now being used commercially in this country and abroad for melting a variety of metals and alloys, such as steel, nickel, nickel-chrome, cupro-nickel, nickel-silver, copper and copper alloys, &c.

As originally developed by Dr. Northrup, of Princeton University, the method of generating high-frequency current was, as was recently described in an article in the ELECTRICAL REVIEW ("High-frequency Heating," by L.C.G.), by condensers and a fixed spark gap, while (as was explained in the same article) valve-type generators have also been used in the ceramic industry and more widely for heating valve filaments. A rotating type of spark gap has also been developed in France.

All these types of furnace are limited in size by their methods of generating high-frequency current, and the capital expenditure per kilowatt generated is necessarily large. Consequently their use is restricted to the manufacture of materials of a comparatively expensive nature and to research work. For these purposes they are of the utmost value, and they already have to their credit the development of the loading of submarine cables, which is one of the greatest advances recently made in telegraphy, as it enables messages to be sent at about five times the speed previously possible.

The field for the use of these small furnaces has not yet been fully explored, and it is probable that in time every well-equipped metallurgical laboratory will contain at least one high-frequency furnace.

It is, however, in the application of high-frequency melting to the comparatively cheap metals and alloys that the main development is to be expected. It is a fortunate fact that as the size of the furnace increases the frequency can be reduced, so that for larger units, which require more power than can be obtained from a valve or spark-gap set, the frequencies fall within the limits which can be obtained efficiently and reasonably cheaply by motor-generators. Units up to 650 kW capacity are already being installed for steel-making, and about fourteen furnaces taking from 100 to 200 kW each are at work or nearing completion in England and France alone. For a 150-kW steel furnace, which holds about 4 or 5 cwt. of steel, a frequency of about 2,200 cycles per second is used, which is obtained from a motor-generator working at a speed of about 3,000 r.p.m., at an efficiency of from 75 to 80 per cent. for the set.

For non-ferrous work, where larger charges can be melted with the same power owing to the lower melting point, frequencies as low as 500 cycles or even less are giving excellent results, while 650-kW plant, which will melt about one ton of steel in an hour, will work at a frequency between the above figures.

There is no reason to think that the limit of size has yet been reached, or even approached, as the experience gained with each increase of size furnishes valuable information for the next advance, and there is every prospect of steel furnaces of four or five tons capacity being constructed before long. Manufacturers of electrical machinery in this country at first showed no great desire to make motor-generators running at a speed of 3,000 r.p.m. and giving frequencies of over 2,000 cycles, largely on account of the expense of designing and building the first set and their uncertainty whether the future developments of high-frequency melting would ever be sufficient to make the trouble and expense incurred in the manufacture of the first plant worth while These doubts have now disappeared, and it is satisfactory to know that English-made machines are being imported into France in spite of the protective tariff.

The manufacture of satisfactory condensers was also a problem which required a great deal of investigation and expenditure for its solution, as the conditions are different from those in which condensers for ordinary power-factor correction are required. The success with which this difficulty has been overcome is shown by the fact that large numbers of English-made condensers have been imported into France, Germany, and Switzerland for use with high-frequency furnaces.

While, as has been stated already, this method of heating is being used for melting a variety of non-ferrous metals and alloys, it is probably in the manufacture of steel that the chief advances will be made. A number of furnaces have already been installed for this purpose, and it is found that the quality of the steel is uniformly at least as good as that of the best crucible steel, while for alloys containing a large proportion of heavy metals, such as tungsten, the homogeneity obtained through the complete mixing by electrical effects produces a better steel than can be made by any other process. The cost is much less than that of the coke- or gas-fired crucible, largely on account of the lower labour costs. There is also a complete absence of gases, which introduce sulphur and other objectionable elements into the steel.

An advantage which the high-frequency furnace has over all other types except the convertor is the rapidity with which it works. A heat can be made every hour, as compared with three to six hours for a medium-sized arc furnace, and eight to twelve hours for an open-hearth furnace. This fact must be taken into consideration when estimating the capital expenditure required for any given output. The fact that the same tonnage

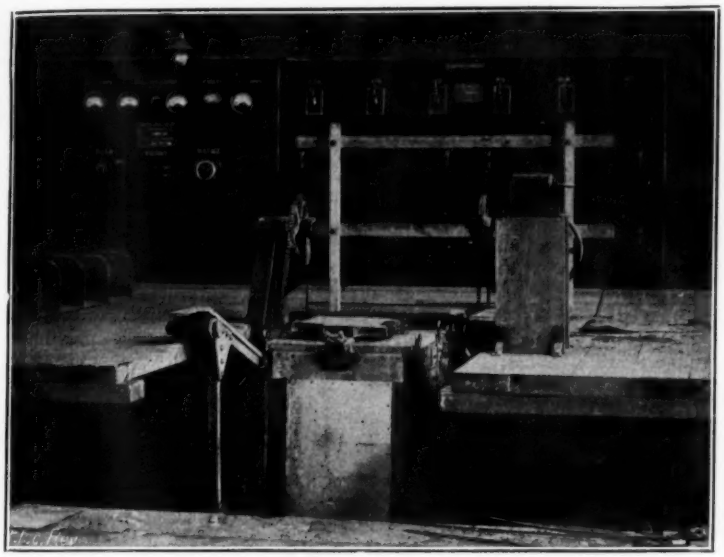


Fig. 1.—Lay-out of 150-kW High-frequency Electric Furnace.

can be obtained with a smaller unit greatly reduces the cost of all the subsidiary buildings and plant. The lifting capacity of the crane can be much lower, so that the whole building can be of a lighter character, while the space required is less owing to the heats being small. For making light steel castings this is of great importance, as only a relatively small number of moulds need be prepared for each heat, so that the moulding space is far less than with an arc or open-hearth furnace. Both for castings and ingots no ladle is required, as the metal can be poured from the furnace direct into moulds, arranged either on a turntable or on a travelling bogie.

The efficiency of the furnace is high, owing largely to the rapidity of melting. The performance of a 150-kW furnace melting steel was recently examined, and it was found that an efficiency of 60 per cent., including motor-generator and all other losses, was obtained, while that of the furnace itself, excluding the motor-generator, was over 80 per cent.

For all these reasons it is certain that in time high-frequency furnaces will replace crucible melting in all cases where the output is sufficient to justify the installation, and in many cases they will take the place of arc furnaces and even of small open-hearth plants.

The illustrations here reproduced are typical of a 150-kW Ajax-Northrup steel furnace such as has been installed in several works in Sheffield and on the Continent.

Fig. 1 shows the furnace lay-out, with the instrument and condenser switch panels. The instrument panel includes two ammeters, one in the condenser circuit and one in the coil circuit. The condensers are arranged in units of various sizes so that condensers can be switched in or out to obtain unity power factor, as indicated by the ammeters. Other instruments include a watt-hour meter, voltmeters in the low- and high-frequency circuits, and an ammeter in the low-frequency circuit: field regulation and push button control are also provided.

Fig. 2 shows a motor-generator built by the English Electric Co., Ltd., running at 3,000 r.p.m. at a voltage of 1,200 on the high-frequency side and giving a frequency of 2,200 cycles. The motor is squirrel-caged, and is started by means of an auto-transformer.

The condensers used with the plant here illustrated are of the oil-immersed self-cooled type made by British Insulated Cables, Ltd.

High-frequency steel melting, which is, as has been stated above, the most valuable application of this form of heating, has been to a large extent developed in this country. The first plants in the world for making tool steel were erected in France by an English company, and the largest furnace yet constructed will shortly be in operation in France, equipped with a British motor-generator and condensers and other material, and designed in England.

The process is still in its infancy, the first experimental motor-generator plant in this country having been installed less than two years ago, and progress has already been far more rapid than with the arc furnace. It is not yet known what are its limitations in size and in the quality of metal that can be commercially produced, but that they are far in advance of anything that has yet been done is certain.

Modern Welding Developments.

Electric arc welding by means of metal electrodes has now been known for over sixteen years, and the fact that alloy metals can be effectively welded by the use of metal electrodes which will produce in the weld metal of the same composition is claimed to be entirely due to Alloy Welding Processes, Ltd., which now markets over twenty different kinds of electrodes. The company now devotes itself solely to the manufacture of alloy welding materials, and when use is made of them a strength of 100 per cent. is guaranteed in practically every steel alloy available. Similar strength can also be obtained in many non-ferrous alloys, and it is interesting to note that it is very probable that an aluminium electrode will soon be placed on the market; experiments have, for some time, been carried out by the above-named company for placing this electrode on the market for commercial use.

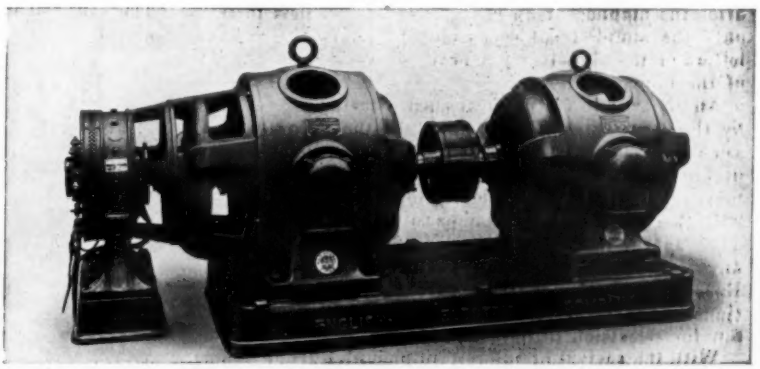


Fig. 2.—High-frequency Motor-Alternator, 150 kVA, 1,200 V, 2,200 cycles.

Television.

A Review of the Present Stage of Development.

By T. THORNE BAKER.

THE difference between television and photo-telegraphy is more pronounced than that existing between kinematography and still photography, inasmuch as in television there is no actual transmission of a photographic image. The image is merely analysed by a machine which may be compared with a camera; the image is focused upon a photo-electric cell, but is never developed—it is sent in a latent state to the distant receiving apparatus and there reconverted into a new image at the same instant that it is being recorded.

The early ideas of Rühmer, Rignoux and Fournier, Belin and others was to cast an image of the sitter or subject, by means of a lens, upon a screen built up of numbers of closely packed selenium cells—a sort of honeycomb. Each cell was connected with a corresponding unit of a similar honeycomb or mosaic at the distant viewing instrument, where a small lamp was situated behind a piece of opal glass, the lamp giving the first public demonstrations of television, establishing the practical possibilities of the new science.

In all these new systems the idea of a bank of sensitive cells—the honeycomb or mosaic—has been abandoned, and in its place a mechanically moving device is employed to *explore* or *scan* the image. We have already agreed that every subject consists of tiny fragments or sections, like the dots in a newspaper half-tone illustration. Imagine such an illustration enormously enlarged, and pasted up on a hoarding, and a narrow beam of light from an electric torch-lamp shone over the surface, the beam just embracing the area of one dot at a time. As the light beam scanned the surface of the picture, it would be possible to analyse the size—*i.e.*, in our case the brightness or darkness—of each individual dot one after another, and every time the beam had swept over the whole surface one complete analysis of the tones of the picture would have been made.

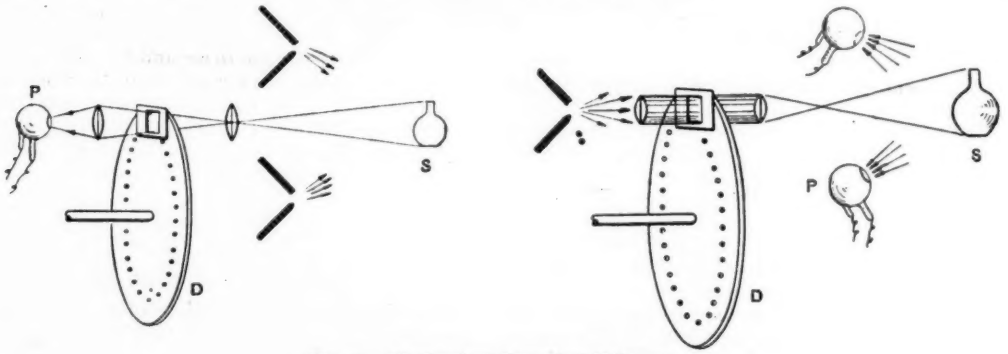


Fig. 1.—Mechanical Scanning Schemes.

being in series with a battery and the selenium cell, with or without the intervention of a galvonometer control or a relay. The bright and dim parts of the image projected on the sensitive cells, of course, controlled their resistances, with the result that the lamps in the viewing box glowed with proportionate intensity and a replica of the original image was seen rather after the manner of an electric sign. Needless to say, only the simplest subjects could be televised, such as letters of the alphabet, numerals, or very hazy outlines of the human face.

An immediate criticism of such a method, as viewed by the electrical engineer, would be the need for each selenium cell to be connected with each distant relay or lamp by a separate wire, or else for some synchronously run distributing device to connect up the cells with their corresponding lamps so many times a second. Then again, the lag of the selenium cell would prevent any very rapidly moving subject from being seen. Nevertheless, many patents were taken out for variations of the selenium method, including one by Andersen for television in natural colours.

With the revival of interest in photo-telegraphy came renewed interest in the possibilities of television, and many fresh inventors entered the field. In America the big electrical organisations became interested, and supported research, with the inevitable result that in due course something tangible was realised. In Hungary, Denes von Mihaly tackled the problem, in France, Belin renewed his efforts, in conjunction with Holweck, while Dauvillier worked on other lines. In England, as everyone knows, Baird worked almost single-handed, and by sheer application and courage succeeded in

Now imagine that the picture to be scanned is the actual face of a human being, and the torchlight beam a concentrated pencil of light mechanically directed over the surface of that face. As the pencil of light strikes light and dark parts of the face—the whites of the eyes, the dark pupils, dark hair, and so on—more or less of the incident light will be reflected back. The reflected light is thrown upon a photo-electric cell, and its varying intensity causes the cell to generate correspondingly, more or less, electromotive force.

The two simplest schemes of mechanical scanning are shown in fig. 1. On the left we see two arc lamps illuminating the "subject," S, the light from which is reflected through an aperture in the perforated disk D upon the photo-electric cell P. On the right is seen the alternative and preferable arrangement, where, instead of the whole subject being continuously illuminated, the pencil of light from a single source is directed through the aperture in the disk upon successive parts of the subject, and the light *reflected* from it is cast upon the cells.

The factors governing the design of a scanning device are (i) the amount of detail that is required in the transmitted image, (ii) the sensitivity of the photo-electric cell, and (iii) the existing limits of valve amplification of the photo-electric currents.

From the details that have been published of various television apparatus, it would appear that the practical limit for the moment is the division of the subject into 2,500 parts; in other words, each 1/2,500th part of the area of the subject is dealt with at a time, and the units so treated are converted into electrical signals of corresponding strengths. The sensitivity of the photo-elec-

tric cell is such that a response can be made in about a millionth of a second to a change in light intensity, though the more powerful cells which contain a trace of inert gas do not act so rapidly. With present television systems the sensitivity of the cell and its quickness in response are ample, but it is doubtful whether

Fig. 2.—Observer and Picture.

the present form of cell would be equal to the strain of differentiating the immense number of changes in light intensity that would be involved in the transmission of a theatrical or racing subject. The necessary amplification of the photo-electric currents introduces faults due to valve characteristics, and as the amplification must necessarily be very great, this factor is of considerably more importance than it is in the case of wireless transmission of music or the voice.

The method of scanning that has so far been adopted is, as already stated, that of illuminating the subject —or the cell—by means of a revolving disk provided with staggered apertures; in Baird's original apparatus 32 apertures, each fitted with a lens, were used, while in the Bell transmitter 50 simple apertures are employed. The displacement of the apertures relative to each other is such that the whole of the image is swept by the beam of light in the form of transverse stripes during one revolution. The stripes are in turn broken up by means of transverse slots in a frame or second disk revolving behind the first disk. Mechanical amplification of this system makes it possible to make a further sub-division of the image. Whatever this may be, however, complete scanning of the whole image must take place within a sixteenth of a second, this being the limit of the persistence of vision. Eighteen pictures are actually sent per second in the Bell system, it being a well-known fact that the requisite number of successive images bears a fixed ratio to the logarithm of the intensity of the light.

Dr. Alexanderson, whose system has recently been demonstrated with success, explores the image by means of a rotating polyhedron, each face of which is a mirror. The polyhedron, as it revolves, reflects the light from successive portions of the image upon the photo-electric cell.

It may be parenthetically remarked here that Mr. A. A. Campbell Swinton's idea of using a mosaic of light-sensitive cells upon which the image falls, each cell being activated in succession by an electromagnetically directed beam of cathode rays, is one of great promise, and would appear to be the basis of the television system of Belin and Hollweck, of which much has been heard (in the way of claims!) during the last eighteen months.

We must confine ourselves in this article to the systems of Baird and the Bell Telephone Company, which have been practically demonstrated, and both of which depend upon the rotating disk with staggered perforations. Figs. 1 and 2 are reproduced by the courtesy of the American Telephone and Telegraph Co.

The conversion of the currents generated by the photo-electric cells into wireless signals is a matter which need not be discussed here, as it presents little or no novelty to the electrical engineer. It must be pointed out, however, that three separate channels may have to be provided—one for the image signals, one for the synchronising signals, and a third for the voice transmission, if we are to see and hear at the same time.

The need for the second channel brings us to the important question of synchronisation and reception. It is fairly obvious that at the receiving station there must be a perforated disk of corresponding type to that of the transmitter, which is revolved in exact step with it. This, of course, involves the use of synchronous motors, and the synchronising signals must be transmitted along with the image signals. Fig. 2 shows an observer looking at a televised picture; the perforated disk is seen attached to the synchronous motor; behind it is a neon lamp which is excited by the received television signals. As is well-known, a high-frequency lamp of this type will glow, over a certain range, with a brightness almost proportional to the voltage

The distant scene is made visible to the audience on the glass screen in the centre of the picture. Dr. Frank Gray, who is largely responsible for that method of receiving, stands at the left, his hand resting on the screen, behind which is the loud-speaking telephone.

Fig. 3.—Receiving Apparatus for Television set up in the Auditorium of Bell Telephone Laboratories in America.

Mr. E. F. Kingsbury, of Bell Telephone Laboratories, as he talks to the microphone, is being viewed by three photo-electric eyes located behind the three screens of the panel immediately in front of him.

Fig. 4.—Transmitting Apparatus for Television Installed at Washington, U.S.A.

applied to it. The dimensions of the small frame seen in front of the disk are such that the length from top to bottom of the rectangular aperture is equal to the displacement between the first and the fiftieth aperture on the periphery of the disk. As this disk is running in exact step with that of the transmitter, the observer sees a reconstruction of the image due to rapid successions of light flashes of the right intensity appearing in their proper relative positions.

In fig. 4 is seen a man speaking into a microphone sitting before the Bell transmitter, the three photo-electric cells which receive the light reflected from his face being situated behind the one horizontal and two vertical grids shown. A large receiving apparatus in which the televised picture takes the dimensions of 24 × 30 inches is seen in fig. 3. This screen is illuminated by a neon tube made in the shape of a jumping cracker, wound back and forth upon itself 50 times. Outside the tube are placed 2,500 electrodes; inside the tube is one long continuous electrode. By means of an elaborate distributor working in synchronism with the transmitting disk, each current as it is received is diverted to its correspondingly spaced electrode and illuminates a part of the grid with the right degree of brilliance. With this receiver a televised image can be seen by the whole audience of a theatre, and it is probably an apparatus of this type that will first be used for any public purpose.

A highly important development in the synchronisation of television apparatus was recently shown to members of the American Physical Society. Electric oscillators controlled by vibrating quartz crystals have been devised by Messrs. J. W. Horton and W. Marrison which permit of two stations being kept in perfect synchronisation without the intermediary of wireless signals. They provide effective synchronisation within one part in ten million, and offer such important advantages that the way is at length opened for the consideration of more complicated subjects.

A great deal might be said of other projected systems of television, but so much has been prophesied and so little actually achieved that it is at the present time hardly worth considering more than the three systems of Baird, the American Telegraph and Telephone Company, and the General Electric Company (U.S.A.).

Whether the present type of scanning device—with the perforated disk—can ever be elaborated by multiplication of the sub-dividing sectors to deal with a really large number of units, remains to be seen. Only in this way can anything in the nature of an interesting subject be dealt with. Looking at the matter dispassionately, one cannot help feeling that the results obtained with highly complicated and costly apparatus are extremely crude, and highly discouraging. To speak about our being able on a "home" set to watch horse-races, regattas, and theatrical productions is farcical. Given all the possibilities presented by the incredible progress that is being made to-day in electrical science, the hopes held out to those following television have in many cases been utterly unjustified.

Television must, in fact, be looked upon as nothing more for the time being than a scientific experiment. The fact that it has taken such a hold on popular imagination may prove to be one of the greatest obstacles to its legitimate progress.

The Central Scotland Electricity Scheme, 1927.

Some Further Details of a Technical Character.

MR. Archibald Page, president of the I.E.E., being also chief engineer of the Central Electricity Board, it is peculiarly appropriate that the summer meeting of the Institution of Electrical Engineers should have been held this season partly in Scotland's industrial belt, an area of 5,000 sq. miles populated by 4,000,000 people (see map, fig. 1), which is the chosen location of the first section of the national "grid" of 132-kV main overhead electric power bulk transmission lines which is to be established eventually throughout Great Britain, serving also to interlink the selected capital generating stations, as part of the reorganisation of the country's means of producing electricity and their standardisation on an a.c., 3-phase, 50-cycle basis.

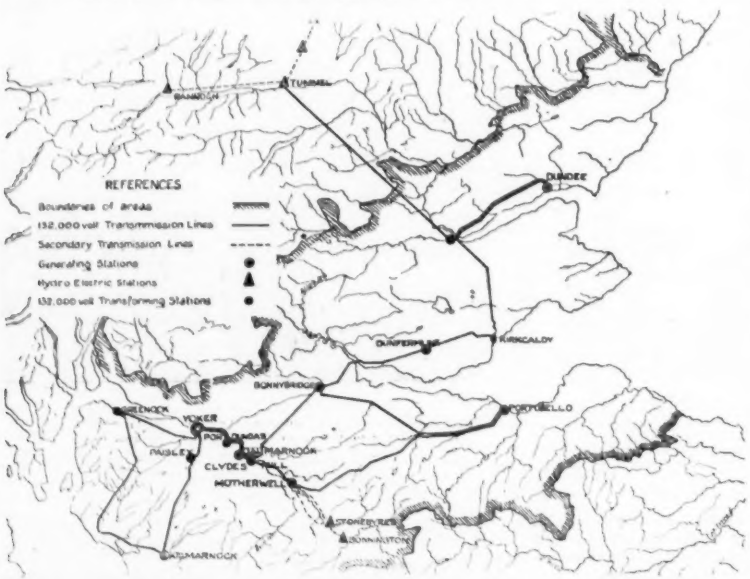


Fig. 1.—Central Scotland Electricity Scheme, 132-kV "Grid"-line Routes.

Framed by the Electricity Commission in compliance with the Electricity (Supply) Act, 1926, and adopted by the Central Electricity Board, some details of the scheme and line equipment have already been published.* In the Central Scotland area there are 42 authorised undertakings, 10 existing generating stations have been "selected," and two new ones are contemplated: the contract for erecting the 260 circuit miles of transmission lines was secured by British Insulated Cables, Ltd., which expects to complete the inner ring linking the stations of the Clyde Valley Electrical Power Co. (of which Mr. Page was formerly the general manager) and the Glasgow Corporation by

* ELEC. REV., May 13th and July 8th, 1927, pp. 68 and 754.

the end of 1928. Lattice steel towers 70 ft. high spaced 800 ft. apart will carry 0.77-in. steel-cored aluminium conductors; the lines will have a carrying capacity of 50,000 kVA, at which load the corresponding current will be 219 amperes, the mean spacing being 17 ft. and the critical corona pressure 185 kV. Each string of suspension insulators will consist of nine cape and pin-type 10-in. diameter insulators with guard rings and arcing horns.

There will be 15 sub-stations, or "grid points," all of the outdoor pattern, and fig. 2 illustrates a typical lay-out: the reason for the decision not to tap any "grid" line for a load below 10,000 kW becomes apparent when it is remembered that the simplest means of doing so (including in every case two transformers, one being a stand-by to the other) will involve the expenditure of £40,000. The transformers are being manufactured by the Metropolitan-Vickers Electrical Co, Ltd., the English Electric Co., Ltd., and Ferranti, Ltd. A standard range of 10, 15, 20, 30, 45, 60 and 75 thousand kVA has been agreed upon, and all sub-stations will accommodate any of these sizes;

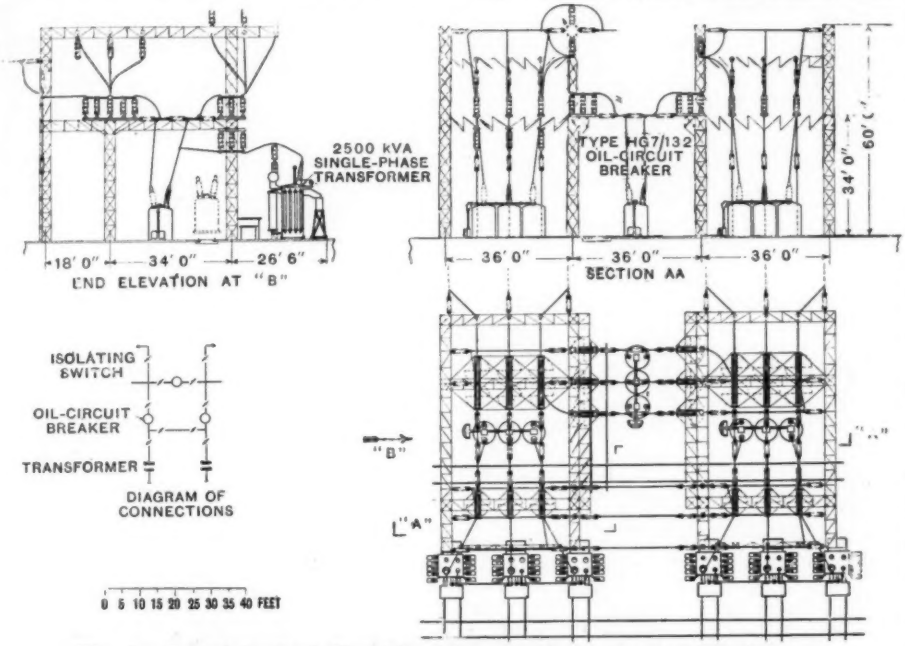


Fig. 2.—Central Scotland Electricity Scheme; typical Lay-out of Sub-station.

transport considerations have influenced their design considerably, 30,000 kVA being apparently the limit for 3-phase transformers in one tank. They will be oil-cooled, supplemented by air blast when operating at over 50 per cent. of full load, the fans being automatically started under thermostatic control. They will be star-delta connected with their neutral points earthed on the e.h.p. side, but not through resistances or reactances. Secondary 33-kV transmission systems will be earthed at "grid points," when necessary, with the aid of separate transformers, which will also be utilised to energise the auxiliary equipment. "On load" tappings at the transformers will provide for 10 per cent. plus or minus voltage regulation.

The switchgear is being made by the British Thomson-Houston Co., Ltd., and the Metropolitan-Vickers Electrical Co., Ltd. The rupturing capacity of the circuit breakers is to be 1.5 million kVA, and they will be interlocked throughout.

The shorter lines will be provided with pilot wires and balanced protective gear, while on the longer ones impedance relays in conjunction with the multiple earthing of the system at the neutral points will ensure, it is claimed, good selective discrimination. The gradual change-over of the Glasgow Corporation and Clyde Valley E.P. Co.'s 25-cycle systems to the standard frequency of 50 cycles per second is expected to begin early in 1929.

The hydro-electric power generated at the Bonnington and Stonebyres stations of the Clyde Valley E.P. Co. will be fed into the system, and the Central Electricity Board has also contracted to accept 12,000 kW generated at Loch Rannoch (see fig. 1) from the Grampian Co. at an annual load factor of 50 per cent.

Constant Full-Load Distribution.

A Demonstration of the Wilkinson "Change-Circuit" System of Hot-Water Storage.

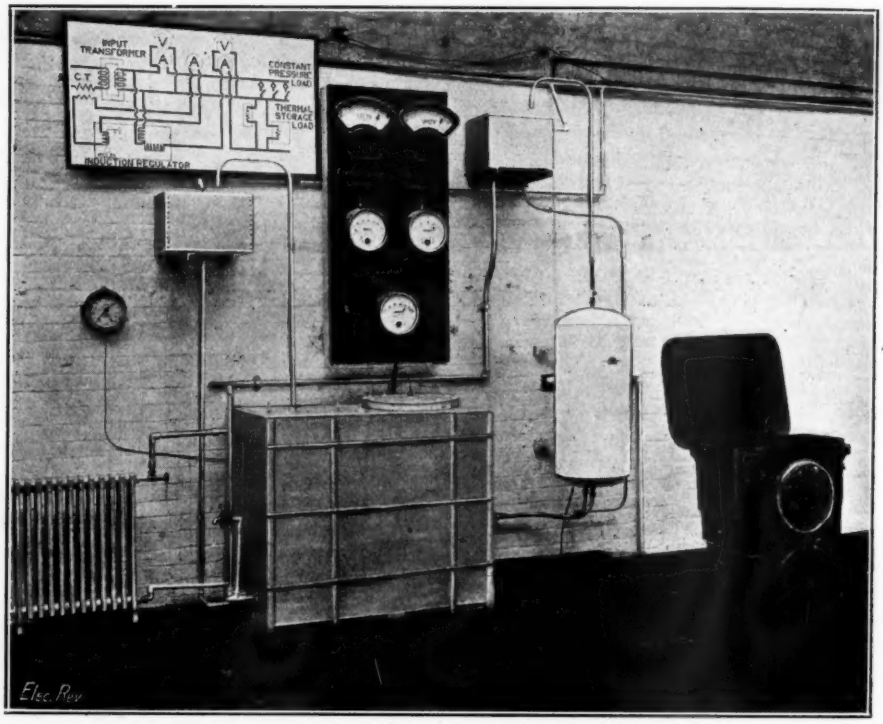
IF there is one dominant problem in the electricity supply industry it is that of raising the load factor to secure the continuous profitable employment of generating-station plant, an immediate result of which would be lower generating costs and cheaper distribution. All energy that can be generated and sold outside the normal load can be produced at a cost materially less than the average cost per kWh sold within the normal load line, as practically no addition is made to the permanent standing charges already incurred in producing the normal output of the works. At the same time the standing charges are spread over a larger number of kWh, a result of still greater importance to the consumer. Two points emerge in connection with this class of supply that will be immediately apparent: (1) the additional output should not be used for purposes that will take the place of the ordinary supply included in the normal daily business of the undertaking, and (2) if customers are to avail themselves of it some form of storage is necessary so that the supply can be taken at all times when it is available and at the rate required by the customer. The constant full-load electrical distribution, otherwise the "change-circuit," system which has been worked out by Mr. George Wilkinson, M.I.E.E., M.I.Mech.E., and the English Electric Co., Ltd., fulfils these dual conditions and insists that the supply shall be used in the form of hot-water storage.

It is the common experience that 70 per cent. to 80 per cent. of the energy consumed in all-electric houses is in the form of low-grade heat, that is, heat below the boiling point of water for room heating, and for kitchen and bathroom services. The chief merit of the "change-circuit" system is that provided there is efficient hot-water storage plant on the premises, it enables the supply authority to give an off-peak supply at all times and seasons, without interfering with the regular class of business falling within the ordinary load curve. Previous articles on the system appeared in the ELECTRICAL REVIEW of June 17th, 1927, and January 27th, 1928.

The essential principle of the scheme is the use of two independent feeders with one common line, one of the feeders being maintained at constant voltage for the customary lighting, domestic or industrial load, while the other supplies energy at a variable voltage for thermal storage and similar purposes. The voltage on the change-circuit feeder is automatically varied so as to maintain the sum of the loads, *i.e.*, the total load on the sub-station, at approximately full load

continuously. By filling up the valleys in the load curve the increased cost of production is very little more than the cost of fuel, and it is estimated that the so-called "out-of-bounds" load from modern generating plant can be supplied at ½ penny per kWh. For the voltage variation, English Electric induction regulators have been adopted.

A complete change-circuit equipment has been installed at the Stafford works of the English Electric Co., Ltd., and was inspected last week by a number of electrical engineers from various parts of the country. The demonstration was made with standard hot-water storage vessels: a 195-gallon tank, immersed in which was a 15-gallon cylinder to pick up the heat such as might be required for bathroom and kitchen services; a radiator by the National Radiator Co.; a 25-gallon Heatrae cylinder; and other heating apparatus by Messrs. Belling and Messrs. Watson - Norrie, Ltd.



The Wilkinson "Change-Circuit" System Demonstrated at Stafford.

In operation, the normal supply is at constant voltage and serves the ordinary lighting, domestic and industrial load. The induction regulator, designed with a 1/1 ratio and the rotor and stator windings being connected in series, is a highly efficient unit giving a voltage range from zero to double line volts. When the transformer is fully loaded with ordinary load, the voltage across the regulator is zero and no power is supplied to the thermal-storage circuit. When the ordinary load falls to its minimum, as in the early morning hours, the regulator gives maximum e.m.f., and the total load on the transformer is maintained constant by the thermal-storage system.

This system for automatic hot water production, and general heating purposes, by the utilisation of off-peak current seems to be one of the cheapest forms of heating; it is certainly competitive in the matter of cost with other less convenient methods of heating. As the control of the heat is automatic, the water is not allowed to reach boiling point; therefore there is a check on the wastage of energy. The supply automatically ensures protection against cooling losses and is under effective control when used for room heating, with the means for stopping the heat emission entirely when the apartment is not in use.

Effective control of the current is obtained by an ingenious method. The maintenance of constant current on the input side of the transformer is aimed at, and therefore the control impulse is initiated from a current transformer in series with the primary supply feeder. The secondary current of this transformer, which is proportional to the line current, heats a thermostatic strip consisting of two different nickel-iron alloys rolled together. This strip is flat at 15 degs. Cent. and deflects with increase in temperature. The free end of the strip works between two contacts which are adjusted so that no contact is made either way with normal full-load current. If the load varies, the altered temperature of the strip causes contact to be made in one direction or the other, thus closing the contactor circuit for "raise volts" or "lower volts" on the change-circuit regulator. To compensate for atmospheric changes, the contacts themselves are carried on similar bimetal strips designed to secure uniform spacing of the contacts at all atmospheric temperatures. The amount of surplus load which can be absorbed in thermal storage will vary according to the time of the year, and this can be adjusted in another way, *i.e.*, by installing another current transformer in the change-circuit feeder.

Viewing the change-circuit system in the light of pronouncements by some of the leading members of the electrical engineering industry, it would seem that the economic aspect of the "all-electric" house would be materially improved by the use of the change-circuit system for thermal storage purposes.

Visitors to the works took the opportunity of inspecting new plant under construction, including various types of induction regulators; three vertical-shaft 12,350-kVA alternators for the Perak Hydro Electric Power Co., Ltd.; d.c. generators of 3,400 kW. 10,000 amp., 240 r.p.m., for the Lochaber power station of the British Aluminium Co., Ltd.; single-phase alternators for the Electric Furnace Co.; 110 000-V oil circuit breakers; transformer kiosks; compound-filled and other types of switchgear; a 24 500-kVA alternator for Glasgow Corporation, and various types of transformers for cable testing.

Legal.

Robert Bosch A.G. v. R. H. Cook & Co.

MR. JUSTICE ROMER, in the Chancery Division on July 13th, refused a motion by the Robert Bosch A.G., makers of magnetos, asking for an injunction restraining alleged breach of agreement and the passing off by R. H. Cook & Co., Broadway, N.W., as "Bosch" magnetos, of goods not of the plaintiffs' manufacture.

Mr. BRAY, for the plaintiffs, said that before the war the magnetos made by the plaintiffs were known everywhere by the name "Bosch," but during the war there was considerable importation into this country of magnetos made by the American Bosch Magneto Corporation. After the war the plaintiffs began to use the word "Bosch" again and obtained injunctions against various people. They applied to register the word "Bosch" as a trade mark, and succeeded, but pending an appeal against the decision of the Registrar they found that the defendants had been selling magnetos under that name which were not made by the plaintiffs. The defendants signed an agreement undertaking not to do so again, but he understood that they were attacking that agreement on the ground that it was misrepresented that the plaintiffs had the exclusive right to the word. On the appeal Mr. Justice Astbury held that the American company had concurrent rights to use the word "Bosch" here because of the extensive importation of its magnetos. The defendants, he said, had advertised for sale "genuine Bosch magnetos" and had sold one which contained a genuine "Bosch" base-plate and housing, but also other parts not made by the plaintiffs or the American company.

Mr. SHELLEY, for the defendants, denied that the plaintiffs had any exclusive right to the use of the word here, and declared that the agreement was entered into by the defendants under the misrepresentation—no doubt innocent—that the plaintiffs were so entitled.

His LORDSHIP said the plaintiffs had established no case for interlocutory relief, and they must wait until the trial to contest the matter. There was no evidence that either the public or the trade understood that a "Bosch" magneto meant one manufactured by the plaintiffs.

Pragnell v. W. T. Henley's Telegraph Works Co., Ltd.

THE Court of Appeal, consisting of Lords Justices Scrutton, Laurence and Greer, on July 13th dismissed an appeal by Mr. George L. Pragnell and his wife, of Sandown, Isle of Wight, from the verdict and judgment dismissing the action which they brought against W. T. Henley's Telegraph Works Co., Ltd., under Lord Campbell's Act for the death of their son Arthur Pragnell, who on July 5th, 1927, was killed at Wootton, Isle of Wight, whilst working for the company and acting as driver's mate on a steam tractor. The company was at the time laying

electric cables in the road and had dug a trench across the road and had contructed over the trench a temporary bridge to carry the traffic using the road. Owing to the bridge not being sufficiently strong plaintiffs alleged that Arthur Pragnell was violently thrown off the tractor and killed.. The case for the appellants was that the verdict of the jury at the trial at the Winchester Assizes before Mr. Justice Acton and a common jury was perverse and against the weight of the evidence.

Without calling upon Counsel for the respondent company, Lord Justice SCRUTTON, in delivering judgment dismissing the appeal, said it was for the plaintiffs to prove that the defendants' servants had been negligent, and that they had not done.

The other members of the Court concurred.

Peacehaven Electric Light and Power Co., Ltd.

MR. JUSTICE MAUGHAM, in the Chancery Division on Monday last, sanctioned the petition of the Peacehaven Electric Light and Power Co., Ltd., for a reduction of its capital from £20,000 to £11,174 8s.

Mr. HECKSHER, for the company, said it was proposed to write 8s. per share off each £1 preference share and 4s. per share off each 5s. ordinary share. The company was formed in April, 1922, by one of the companies interested in Peacehaven, and the latter company guaranteed the interest on the preference shares for five years, which guarantee had now ceased. The company had made considerable losses, but under the provisions of the New Electricity Act as to supply, it had applied to the Electricity Commissioners for recognition, and that would be granted, he was instructed, on condition that the company took its supplies in bulk from the Newhaven and Seaford Electricity Co.

Counsel said he understood that an agreement had been prepared and approved to comply with this condition.

His Lordship asked what was the point of getting recognition from the Electricity Commissioners.

Mr. HECKSHER said that without it the company could not carry on business.

Evidence was read to the effect that the company's losses amounted to £8,825.

English Electric Co., Ltd., v. Crompton Parkinson, Ltd.

MR. JUSTICE ROMER, in the Chancery Division, on July 10th, had before him the motion, adjourned from the previous week (*vide* ELEC. REV., July 6th, p. 24), in which the English Electric Co., Ltd., sought an injunction restraining Crompton Parkinson, Ltd., from infringing the copyright in certain of the plaintiffs' photographs of the "Standard Specification core-type transformer."

Mr. KENNETH SWANN, for the plaintiffs, said the allegation was that the defendants had used the photographs in their trade literature as a means of advertising their electrical machinery. The motion stood out for a settlement, but no move had been made by the defendants. They had, however, referred in an affidavit to the correspondence in which offers were made to return the photographs which were the property of the plaintiffs, to discontinue the insertion of the advertisements, and to pay £5 damages, and costs.

The plaintiffs, however, regarded that as a wholly unsatisfactory offer because serious damage had been caused to them by the publicity given to the photographs which in fact showed the machinery of the plaintiffs.

Mr. TREVOR WATSON, for the defendants, said he was willing now, and always had been willing, to give an undertaking, but defendants desired to have his Lordship's view as to the course taken in this action. This motion was wholly unnecessary as a means of protecting the plaintiffs or for any other purpose. The defendants offered everything to which the plaintiffs were entitled before the issue of the writ, and on several occasions they had given an undertaking. This motion, he submitted, was for the sole purpose of obtaining publicity.

His LORDSHIP said that he would accept Mr. Watson's undertaking, and make no other order than that the costs be reserved.

Mr. SWANN said that he would be prepared to make an end of the matter that day.

Mr. WATSON stated that he was not prepared to treat the motion as the trial of the action.

Fraudulent Consumption of Electricity.

AT the Northampton Police Court on July 11th, Harold Austin Bassett-Lowke, trading as the Lowke Domestic Engineering Co., was charged with the fraudulent consumption of electricity valued at over £8, the property of the Northampton Electric Light and Power Co., Ltd. It was stated for the prosecution that the defendant was a director of a company carrying on business in Northampton, and when the company gave up business the defendant applied for the continuation of the electricity supply. There were five separate meters on the premises, two for heating energy, one for lighting, and two for power. Officials of the company found that defendant was charging accumulators through the heating meter, thereby obtaining energy at the lowest rate. A motor was connected to the other heating circuit while in that same circuit were a number of lights. Under cross-examination an installation inspector said that the wires at the meters were a tangled mass, but the company was not responsible for that. Another witness said that the meters could only be identified by their numbers, but in spite of that the defendant was acting against the company's rules in making any connections to them himself. As the company had sent a bill to Mr. Bassett-Lowke for the energy consumed, the defendant's solicitor submitted that it was treating the matter as a civil debt and there was therefore no case to answer. The Bench decided against this and adjourned the case.

At the same time, according to the *Daily Echo*, Northampton, a similar case was also adjourned.

Upon the resumption of the case on July 14th, the defendant's solicitor said that so far as electricity was concerned his client was in competition with the company, and for that reason the evidence must be carefully looked at. Having regard to the complicated system at the meters it was quite natural to make a mistake. The defendant, giving evidence, said that he had not made the connections himself, but had instructed his foreman to do it, and he thought that everything was correct. A storekeeper employed by the defendant gave corroborative evidence. Eventually the Bench found the case proved and fined defendant £10. His solicitor gave notice of appeal.

The magistrates then heard the other case brought by the supply company against Arthur J. Penn and Francis L. Perrin. The evidence showed that the defendants had a power supply for accumulator charging, and an inspector had discovered three electric lamps connected in the circuit. Perrin stated that he used electricity from the batteries for lighting the lamps, and he was never without a 200-V supply on the premises. Penn, it was stated, was Perrin's employé, and was not responsible for his employer's action. The case against him was therefore dismissed, but Perrin was fined £5.

Alleged Shock from Trolley Wire.

A SETTLEMENT has been arrived at in the Court of Session, Edinburgh, in an action by a Hamilton woman against the Lanarkshire Tramway Co., for £1,000 as damages for personal injuries. Plaintiff was a passenger on one of the respondents' tramcars when one of the overhead wires broke and fell upon her head. She averred that a heavy current passed from the cable to her, and caused her serious injury. Respondents denied fault, and pleaded that they used all reasonable care and precaution in connection with their plant. Plaintiff accepted £275 and expenses in settlement of her claim.

Parliamentary News.

[By Our Special Parliamentary Reporter.]

Rural Overhead Lines.

On July 11th, Mr. HURD asked the Minister of Transport if his attention had been called to the protests of district councils and other bodies, as, for instance, Eastbourne, against the proposed erection of high standards over the countryside in order to carry the new national electrical lines; and what steps he was taking in this matter to carry out the intention of the Government to preserve the beauty of rural England.

Col. ASHLEY said he could not find that he had received any protests against the erection of the standards for the lines of the Central Electricity Board. In order to carry out schemes under the Act of 1926 it was necessary to erect overhead transmission lines; but he had reason to know that the Board was anxious to carry out this work so as to interfere as little as possible with rural amenities.

The Notts and Derby Tramways Co. Bill.

A Select Committee of the House of Commons on July 11th found the preamble of this Bill proved. The measure authorises the company to replace its tramways by trolley vehicles and to run omnibus services. The Ilkeston Corporation and the Heanor and Ripley Urban District Councils opposed the Bill, particularly a clause providing that the company should be protected from competition on routes on which it maintained an adequate service. The company agreed to insert a new clause to guard the public against too high fares. The opponents accepted this, and the Bill was signed by the Committee.

Stretford and District Electricity Board Bill.

The Unopposed Bills Committee of the House of Commons, on July 12th, ordered this Bill to be reported for third reading. It provides for the constitution of the Stretford and District Electricity Board, and proposes to transfer to it the electricity undertakings of the Stretford Urban District Council and of the Barton and Urmston Electricity Board, which was formed two years ago to supply an area adjoining that supplied by the Stretford Council. An agent for the promoters said that last year an agreement was come to whereby the Stretford Council was to supply electricity in bulk to the Barton and Urmston Board. The object of the present Bill was merely to amalgamate the two undertakings for convenience.

Wessex Electricity Bill.

This Bill was also ordered by the Unopposed Bills Committee of the House of Commons to be reported for third reading. Its main purposes are to extend the limits of supply of the Wessex Electricity Company and to increase its capital powers.

Mr. SIDGWICK for the promoters said that there were a number of authorised distributors of electricity in parts of the Wessex Company's area as extended by this Bill, other parts were the subject of Special Orders now before the Electricity Commissioners, and in respect of other parts there were no existing Orders. The companies interested financially in the Wessex Co. were also interested in the companies which held powers to supply in the area or were promoting Orders. It was desired that the Wessex Co. should link up the various distribution areas, and, as far as was necessary, supply in areas in respect of which there were no existing Orders. Authorised distributors were empowered to purchase electricity in bulk from the Wessex Company. The latter had powers to supply for all purposes in areas where there were no authorised distributors; where there were authorised distributors the Wessex Co. could supply in bulk, but not for lighting and domestic purposes, and not for power purposes except with the consent of the authorised distributors concerned. The Wessex Co. was financially interested in the distributing companies, and it was the intention to link the various areas by a grid. The company had controlling interests, or the companies holding the shares of the Wessex Co. had controlling interests. The existing authorised share capital of the company was £750,000, and it was proposed by the Bill to increase it to £1,200,000. The company already had power to borrow to the extent of half the amount of the issued share capital, and, in addition, with the consent of the Minister of Transport, to borrow to the extent of the whole of the issued share capital.

No Relief for Electricity Undertakings.

The Rating and Valuation (Apportionment) Bill was further considered by the House of Commons on July 16th. Mr. GREENWOOD (Labour) moved to extend the operations of the Bill to electricity and gas undertakings which at present, he said, were specifically excluded from the rating relief proposals. He said that the electrical engineering companies were being relieved, and there was the same justification for relieving these statutory undertakings in order that consumers could get cheaper power for productive industry as there was for relieving the railway companies.

Mr. NEVILLE CHAMBERLAIN doubted whether relief given to these undertakings would increase their volume of business as that of the railways would be increased. The cost of power was not generally the most vital factor in the cost of production. Any relief which they could give would be worthless, but, on the other hand, it would take a great deal of the Government's resources and make the general scheme inefficient for its purpose. Messrs. Grotrian, Morgan Jones, Harvey, and Harris supported the amendment, and Sir G. Kohler opposed it. The discussion was cut short by the operation of the "guillotine," and the amendment was defeated by 240 votes to 131.

Business and Industrial Notes.

The Week's Electrical Trade News from all Sources. Commercial and Industrial Developments, Business Changes, Market Prices for Materials, Trade Openings, New Publicity Literature, Liquidations and Failures.

Registered Electrical Contractors.

The following applications for registration were accepted by the Executive Committee of the National Register of Electrical Installation Contractors at its meeting on July 13th:—

Grove Electrical Co., Handsworth, Birmingham.
Mutter & Meinert, Cardiff.
Squire, William W. H., Southend-on-Sea.
Yeldon & Gardiner, Plymouth.
Sewell & Varley, Ltd., Manchester.
Matthews, W. H., Ltd., Chorlton-cum-Hardy, Manchester.
Rogers, S., & Co., Ltd., London, W.1.
Dickinson, W., & Co., Bexley Heath.
Forward Electrical Co., Birmingham.
Werneth Electrical Engineering Co., Ltd., Oldham.
Clark, C. O., Deal.
Bingham, W. T., Sheffield.
French, Bernard, Kidderminster.
Plant & Bird, Oldham.
Speirs, H. M., & Co., Glasgow.
Gwyther, G., Oldham.

At the same meeting six applications were declined.

Recent Contracts.

W. T. HENLEY'S TELEGRAPH WORKS CO., LTD., has just received from the Lisburn Electric Supply Co., Ltd. (Northern Ireland), an order for the supply, erection and installation complete of an overhead line on anchor "A" poles, as well as 33,000-V H.S.I.. type and 6,600-V three-core, paper-insulated cables between Lisburn and Belfast. The contract also covers the supply and installation of a switchboard, transformers, feeder pillars, distributors, house services, meters, cut-outs, &c.

The GENERAL ELECTRIC CO., LTD., has received an order for two Diesel-electric locomotives for the North-Western Railway, India; the order was secured in the face of keen Continental competition. The locomotives are of the 0-4-4-0 type, comprising a power unit on the main frame carried on two four-wheel bogies, the weight of each locomotive being approximately 50 tons when fully loaded. Each locomotive will be equipped with a six-cylinder 350-b.h.p. high-speed oil engine, manufactured by William Beardmore & Co., Ltd., coupled to a 200-kW d.c. generator feeding four axle-hung traction motors each rated at 85 b.h.p. (one-hour rating) at 600 V. A driver's compartment is provided at each end of the locomotive, the electrical control equipment and brake valves being duplicated. The connections between the generator and the motors are arranged to give automatic adjustment of the vehicle speed with the load. The engine is started by motoring the main generator from a battery. An electrically-operated two-speed rotary exhauster is provided for the vacuum brake. Another important order has been received by the G.E.C. from the Palestine Electric Corporation. This is for two vertical-spindle 7,500-kVA alternators, providing a three-phase supply at 6,300-6,900 V, 50 cycles. These machines, which are driven by Boving water turbines at a speed of 250 r.p.m., are for the Jordan power house, and they will supply power to sub-stations situated at Jaffa and Haifa. In addition to the two generator control equipments, 6,300-V brickwork cubicle auxiliary and l.p. a.c. switchboards, the equipment at the Jordan power station includes a set of 66,000-V outdoor switchgear with indoor control panels, consisting of two 7,500-kVA transformer installations and two 7,500-kVA outgoing feeder equipments. A similar set of e.h.p. switchgear will be installed at Jaffa sub-station. The equipment for the two sub-stations mentioned includes 22,000-V switchgear with panels controlling two 3,750-kVA incoming transformers, two 1,000-kVA outgoing transformers, and two 1,000-kVA outgoing feeders. A set of 6,300-V indoor switchgear with remote mechanical control, comprising two 1,000-kVA transformer equipments, is also being supplied to both sub-stations.

The Timber Trade.

Our Timber Trade Correspondent reports that the imports of building timber from northern and middle Europe (from whence we obtain some 90 per cent. of our supplies of these descriptions) are still on a very moderate scale. This, with an improved consumption, leaves stocks now at normal—perhaps a little below. Prices for replacements are higher than for goods sold on the spot, so that the latter market is steady, although competition is more keen than would be generally expected under the circumstances. It cannot be foreseen whether shippers' prices will come down to merchants' ideas, or whether the spot market will rise to meet shippers' quotations. Choice and fancy hardwoods are in limited stock with firm values, the inferior grades being neglected. Of the cheaper varieties of American sawn hardwoods stocks are heavy and prices weak.

Canadian G.E.C. Expansion.

The Natural Resources Intelligence Branch of the Department of the Interior at Ottawa states that the expansion of the present plant of the Canadian General Electric Co., at Peterborough, Ontario, involves the expenditure of approximately $800,000. Of this amount, $300,000 will be devoted to the erection of two buildings of considerable size, affording additional floor space of 41,800 feet, and $500,000 will be required to provide machinery and equipment. The company has plans for an even more extensive programme of extension which will be carried out in 1929 and 1930 if business expands at the rate that has been shown lately. The Canadian G.E.C. is one of Canada's largest manufacturing industries which includes in its scope the largest generators such as are required for Canadian and foreign hydro-electric developments, and also the smallest household electrical appliances and radio sets.

Bankruptcy Proceedings.

H. B. A. ROSENSHEIN (known as Henry Rose), 80, Maida Vale, N.W.—This bankrupt, who was concerned in the flotation of an electric power company in Egypt, applied on July 10th to Mr. Registrar Mellor, at the London Bankruptcy Court, for an order of discharge. Mr. D. Williams, Official Receiver, reported that the provable claims amounted to £5,104, against assets 11s. The applicant was a Rumanian, and had not acquired British nationality. Whilst trading in 1921 as an import and export merchant under the style of the Balkanic Trading Co., he came into touch with one Alexander Biancardi, and, with that gentleman, entered into a scheme to run a motor-omnibus service in Cairo. It appeared that Biancardi was unable to secure the concession from the Egyptian authorities to run the 'buses, and eventually the bankrupt lost £2,000 over the venture. In May, 1923, he was instrumental in the formation of the Egyptian Electric Power Development, which had for its objects the acquisition from the Egyptian Government of a concession for the utilisation of water from the Assouan reservoir for the purpose of developing hydro-electric power for irrigation, light, &c.; that scheme proved abortive, and cost the bankrupt £1,000. Then in May, 1924, he was instrumental in obtaining the sanction of the Egyptian Government for the introduction of the automatic telephone system in Egypt, and as a result an English telephone company (from whom he held a commission note) obtained a contract for the installation thereof. In July, 1926, the bankrupt launched an action against the English company claiming an account of commission said to be due to him, and judgment was signed in his favour for £2,600 and costs. The bankrupt was further interested in the promotion of an Egyptian mercantile marine company, in connection with which a judgment had been obtained against him for £2,300, which was still owing. He attributed his insolvency to the failure of his Egyptian propositions and ventures; to his liability under two guarantees for which he received no consideration, and to lack of remunerative employment since 1925. The application was opposed by the Official Receiver, chiefly on the grounds of rash and hazardous speculation and unjustifiable extravagance in living, and his Honour suspended the discharge for two years.

J. A. HARTIGAN and G. J. D. HARTIGAN, trading as the London Fan & Motor Co., electrical engineers, 81, Charlotte Street, W.—These debtors attended on July 13th before Mr. Registrar Francke at the London Bankruptcy Court for public examination upon a joint statement of affairs showing liabilities of £2,122 and assets valued at £1,012. They were adjudged bankrupt on March 13th, and Mr. E. H. Hawkins, I.A., is administering the estate as trustee. The debtors stated that in May, 1923, they commenced business, in partnership with two other persons, as electrical engineers at Grape Street, W.C., under the style of "The London Fan & Motor Co." They (debtors) each brought in £25, whilst their partners jointly provided £100; and they afterwards traded together until September, 1923, when their partners, to whom they paid £174, retired. They afterwards carried on the business together under the same style, until October, 1923, at the above address, and subsequently at 81, Charlotte Street, Tottenham Court Road, W., until January last, when, being in financial difficulties, they executed a deed of assignment to a trustee for the benefit of their creditors. The trustee subsequently sold the stock, &c., for £200, and collected sundry book debts, which were subject to an agreement executed by them in September, 1924, whereby they charged all book debts due or to become due to them in favour of a cash creditor for £500, and the proceeds of which they had now returned as an asset, the agreement having been declared by the Court void against the trustee in their bankruptcy as regarded any book debts which had not been paid at the commencement of the bankruptcy. The debtors attributed their insolvency to lack of capital, trade depression, and to inclement weather during the summer seasons of 1926 and 1927, which affected the demand for electric fans. The deficiency of £1,092 was largely explained by a net loss of £500 on the trading during the last three years, and a further loss of £433 on defective electrical machinery. The examination was concluded.

W. J. BEATY, 79, Station Road, Ashington, Northumberland, electrical and wireless dealer.—The receiving order in this matter was made recently on the debtor's own petition, and at the first meeting of creditors held recently at the Official Receiver's Office, Newcastle-upon-Tyne, the matter was left in the hands of the Official Receiver, it being a summary case. According to the statement of affairs returned by the debtor there were liabilities of £1,092, against assets of £41, leaving a deficiency of £1,051. The following are creditors:—

	£		£
Ashington U.D.C. ...	93	Gledson J., & Co. ...	45
Bankers	526	Marconiphone Co., Ltd.	35
Edison Swan Electric Co., Ltd.	87	Sun Electrical Co., Ltd.	29
		Towers, G.	213

W. T. LACEY, 10, George Street, Bath, electrical engineer and contractor.—The first meeting of creditors was held on July 11th, at the Official Receiver's Offices, Bristol, when the case, being a summary one, was left in the hands of the Official Receiver as trustee of the estate. The liabilities amounted to £562 gross, of which £538 was expected to rank, with a deficiency of £444. Debtor attributed his failure to loss on a contract and bad trade. The Official Receiver stated that the debtor was manager to a firm of electrical engineers until he commenced business on his own account in 1922. He was fairly successful until three years ago, when he lost between £200 and £300 on a contract.

J. H. PAINTER (trading as Venables & Co.), electrician, 99, The Broadway, Cricklewood, N.W.—An application was made on July 10th to Mr. Registrar Mellor, at the London Bankruptcy Court, for an order of discharge on behalf of this debtor, who failed in March, 1925. Mr. D. Williams, Official Receiver, reported that the estate had realised £240, although valued by the debtor at £580, and a first and final dividend of 1s. 1d. in the £ had been paid on provable claims aggregating £1,698. The debtor attributed his insolvency to bad trade, depreciation in the value of stock, loss on contracts, and insufficiency of profits to meet household and personal expenses, which, during the two years preceding the failure, amounted to £936, against net profits £404. The application was opposed by the Official Receiver on various statutory grounds, including unjustifiable extravagance in living. His Honour upheld the report of the Official Receiver, and suspended the discharge for three years.

G. B. BANKS, trading as the Redditch Radio Co., radio engineer, 16, Market Place, Redditch, Worcs.—The first meeting of creditors was held on July 9th, when the case, being a summary one, was left in the hands of the Official Receiver as trustee of the estate. According to the statement of affairs, there was a deficiency of £491, and the failure was attributed to general depression of trade in the district. Debtor commenced business as a radio engineer at Market Place, Redditch, trading as the Redditch Radio Company, without capital, but stated that his father lent him £150. The business had not provided sufficient profit to meet his living expenses, and he stated that during the last two years trade had declined, and that to enable him to carry on he had further loans from his father, whom he scheduled as a creditor for £350. His father had also guaranteed his banking account to the extent of £100. Debtor's father withdrew his claim, and the other creditors agreed to accept a composition of 13s. 4d. in the £.

L. BARLOW, Meilden, Prestatyn, Flint, plumber and electrician.—First meeting held July 18th. Public examination July 27th, at the Court House, Bangor.

D. M. STRODE, Osnaburgh Street, N.W.1, and 6, Creed Lane, E.C.4, engineer.—Application for discharge to be heard at Carey Street, W.C.2, on July 31st.

J. D. RIDLEY (Eastern Counties Electrical Constructional Co.), electrical engineer, 41, Butter Market, Ipswich.—First meeting, July 20th, at 9, Arcade, Ipswich; public examination, August 10th, at the Shire Hall, Ipswich.

H. NUTTER, electrical engineer, 246, Yorkshire Street, Rochdale.—Trustee, Mr. F. Murgatroyd, Official Receiver, Byrom Street, Manchester, released July 2nd.

A. STOCK, electrical radio engineer, 323, Chapel Street, Salford.—Trustee, Mr. F. Murgatroyd, Official Receiver, Byrom Street, Manchester, released July 2nd.

L. A. N. DIXON (C. Forgham & Co.), electrical engineer, 23a, Princess Street, and Old Post Office Yard, Shrewsbury.—Last day for proofs for dividend July 28th. Trustee, Mr. C. J. Pyke, Official Receiver, 22, Swan Hill, Shrewsbury.

W. ROSS, wireless engineer, 35, Bridge Street, Haverfordwest.—First and final dividend of 4s. 2d. in the £, payable at 4, Queen Street, Carmarthen.

F. H. BARRELL (F. H. Barrell & Co.), electrical and radio engineer, &c., 2a, 2b, and 2c, Church Street, Staines.—First and final dividend of 2s. 11¾d. in the £, payable at the Official Receiver's office, 29, Russell Square, W.C.1.

Company Liquidations.

SUPER SUCTOR SALES, LTD., 75, Victoria Street, S.W.1, electrical engineers, &c.—A meeting of creditors was held last week at the offices of Messrs. Hubbart, Durose & Pain, 46, Holborn Viaduct, E.C. Mr. E. L. Donald, the liquidator, reported that the assets were estimated to realise only £516, and they were subject to Crown debts of £75, and preferential claims amounting to £1,244. There was a deficiency so far as the preferential creditors were concerned, of £803, and there were no assets available for the unsecured creditors, who were scheduled for £2,227. The ranking liabilities were put down at £3,030, with a deficiency of the same amount. The company was formed in November last for the purpose of carrying on business as electrical engineers and marketing an electric vacuum cleaner. The nominal capital was £5,000, which was increased in January last to £10,000, divided into 20,000 ordinary shares of 1s. each, and 9,000 10 per cent. preference shares of £1 each. There were issued 19,400 of the ordinary, and 630 of the preference shares were issued for a consideration other than cash. On May 29th a new board was constituted, and it found that unless considerable funds could be raised there was no alternative to liquidation. In view of the seriousness of the position, a resolution for voluntary liquidation was passed. Owing to the incomplete state of the company's books it was difficult to place a value on the book debts. With regard to the stock a large number of the machines were incomplete, or second-hand. Others had been sequestrated by the landlords of the branches.

The position of the company had been brought about through the heavy expenses. The company were only sub-concessionnaires. The price charged for the machines was, he understood, as much as that of better known makes, and, in addition, the machines were German, and there was a prejudice in favour of English goods. The company had also entered into commitments to pay salaries of £350 per annum in consideration of persons subscribing from £500 to £1,000 for shares. Dissatisfaction was expressed by creditors at the position disclosed, but it was decided to confirm the voluntary liquidation of the company with Mr. Donald as liquidator.

PEARL ELECTRICAL CO., LTD., 72, Finsbury Pavement, E.C.—A meeting of creditors was held on July 7th, at 72, Finsbury Pavement, E.C. Mr. A. W. Archibold, the liquidator, submitted a statement of affairs which disclosed liabilities of £844. The assets consisted of book debts of £60, leaving a deficiency of £784. In addition to the book debts there was a small amount of cash at the bank. The company had not carried any stock, and did not possess any office furniture. It was registered in June, 1925, with a nominal capital of £100, all of which was fully paid. No deficiency account was presented, but it was stated that the present position had been brought about through the profit being insufficient to meet the overhead expenses. The meeting was adjourned with a view to an offer being submitted to the creditors. The following are creditors:—

	£		£
Amalgamated Lamp Co., Ltd.	384	Maybrook Electrical Co.	76
Lunar Electrical Co. ...	197	Electric Lamp Services Co.	161

CECIL HODGES & CO., LTD.—Mr. W. A. J. Osborne, Balfour House, Finsbury Pavement, E.C.2, was appointed liquidator, with a committee of inspection, on June 13th.

GAS & ELECTRIC SECURITIES, LTD.—First and final dividend of 2s. 5.1d. in the £, payable at the office of the Official Receiver and Liquidator, 33, Carey Street, W.C.2.

DIRECT ELECTRIC SERVICE (BURY), LTD.—Winding-up voluntarily. Liquidator, Mr. W. Nuttall, 82, Bolton Street, Bury. Meeting of creditors held July 16th. Claims were to be sent to the liquidator by July 14th.

BRITISH PORTABLE RADIO, LTD.—A meeting is called for August 11th, at 31, Bedford Row, W.C.1, to hear an account of the winding up from the liquidator, Mr. W. E. Bundy.

Private Arrangements.

L. W. IRISH and R. G. REEVES, trading as Irish & Reeves, electrical engineers, 101, Grimsby Road, Cleethorpes, Lincs.—A meeting of creditors was held recently, when a statement of affairs was submitted, which showed ranking liabilities of £2,069, all due to unsecured creditors. The net assets were £653, leaving a deficiency of £1,416. It was stated that the unsecured creditors' claims included £700 money lent by Mr. Irish, senior, whilst £443 was due to the bank. A deed of assignment had already been executed in favour of Mr. A. G. Pearson, C.A., 1, Town Hall Street, Grimsby, and if the deed was confirmed, Mr. Irish, senior, would withdraw his claim. The business was commenced in April, 1925, and at that date Mr. Irish, senior, lent £550, whilst in 1927 he advanced a further £150. The present position was attributed to losses on contracts and the small turnover. A resolution was passed confirming the deed already executed, and it was suggested that the trustee should be authorised to offer the assets to a relative of one of the partners at the figures shown in the statement of affairs. The following are creditors:—

	£		£
Wm. Irish	700	Northern Electric Co., Ltd.	57
Bankers	443	Falk, Stadelmann & Co., Ltd.	53
T. Beadle & Co., Ltd. ...	248	British Thomson-Houston Co., Ltd.	50
Brown Bros., Ltd. ...	119	Revo Electric Co., Ltd.	34
General Electric Co., Ltd.	98		
T. B. Morley & Co., Ltd.	75		
J. R. Richardson ...	26		

Dissolutions of Partnership.

PARAMOTOR RELAY CO., 11, Blackfriars Street, Manchester, and 124, Chancery Lane, W.C.2, electrical appliance manufacturers.—Messrs. H. J. Osborn, Alan Wright and G. Bullock have dissolved partnership.

COLLMAN & SOUTHWOOD, electrical engineers, 48, Tavistock Place, Plymouth.—Messrs. V. M. Collman and J. T. Southwood have dissolved partnership. Debts will be attended to by Mr. Southwood, who will continue the business.

NORTHERN ELECTRIC CO., electrical engineer, 292, Stretford Road, Manchester.—Mr. C. T. Rhodes and Mr. C. R. B. Hartley have dissolved partnership. Mr. Hartley will attend to debts and continue the business under the same style.

TURNER & NICHOLS, electrical and wireless engineers, 15, Broad Street, Ross.—Mr. C. J. Turner and Mr. E. C. Nicholls have dissolved partnership.

Reductions of Capital.

CARY, HALLEWELL & CO., LTD., and reduced.—A petition has been presented to the High Court for the confirmation of the reduction of this company's capital from £2,500 to £1,250, and will be heard by Mr. Justice Romer on July 24th.

MAJOR & CO., LTD., and reduced.—The reduction of the company's capital from £450,000 to £326,000 was confirmed by the High Court on June 25th.

For Sale.

Maidstone Corporation has for disposal two "Davey-Paxman" marine boilers with super-heaters, Underfeed "B" type stokers with induced draught fans. (See our advertisement pages to-day.)

New Catalogues and Lists.

MESSRS. PETTERS, LTD., Westland Works, Yeovil.—An illustrated booklet dealing with the company's "Universal" oil and petrol engines for farm use, &c., including electric lighting; and Publication No. 1596, describing a new "Petter-Light" set with radiator cooling.

Mr. J. E. SLEIGHTHOLME, Ingham Street, South Shields.—A postcard illustrating and briefly describing electrically-operated and illuminated table fountains.

MESSRS. GENT & CO., LTD., Faraday Works, Leicester.—Book 6a, containing illustrated particulars and prices of water level indicators and alarms for many applications.

AUTO-BULBS, LTD., Sphinx House, Hatton Garden, E.C.1.—Illustrated price lists of automobile and other electric lamps of many patterns and a catalogue of fuses for all makes of cars.

THE GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, W.C.2.—The "Osram-G.E.C. Bulletin" for July, describing many applications of "Osram" lamps, including the floodlighting of Bath Abbey, &c., the Aldershot Tattoo, and the Brighton sea-front and buildings. There are also articles and notes on other phases of G.E.C. activity.

MR. H. POLLOCK, 31, St. John's Road, Old Trafford, Manchester.—A pamphlet illustrating and describing the "Gladiator" portable arc-welding set.

THE STURTEVANT ENGINEERING CO., LTD., 147, Queen Victoria Street, E.C.4.—Publication No. 1370, dealing with "Ventex" air filters and illustrating several actual installations.

MESSRS. FERRANTI, LTD., Hollinwood, Lancs.—Leaflet W6409, illustrating and describing the "Ferranti" permanent trickle charger embodying the Westinghouse metal rectifier.

MESSRS. FALK, STADELMANN & CO., LTD., 83-93, Farringdon Road, E.C.1.—Catalogue No. 602, containing illustrations, details and prices of electric fans of many patterns.

THE BRITISH ALUMINIUM CO., LTD., Adelaide House, King William Street, E.C.4.—Booklets containing further aluminium data and a leaflet showing the area of the Central Scotland Electricity Scheme for which the company is providing aluminium.

THE MEDICAL SUPPLY ASSOCIATION, LTD., 167-185, Gray's Inn Road, W.C.1.—Sectional Catalogue No. 42, dealing with a large variety of "Medi-Sun" apparatus for ultra-violet-ray treatment and all kinds of auxiliary equipment.

MESSRS. J. A. CRABTREE & CO., LTD., Lincoln Works, Walsall.—"The Crabtree"—the company's house organ containing interesting notes on "Crabtree" products; Leaflet No. 1050, illustrating and describing the company's "splitter" units; and a sample of an all-insulated quick make and break switch with the dolly in section to show the thickness of the protective material and method of construction.

THE ELECTRICAL EQUIPMENT & CARBON CO., LTD., Bank Buildings, 107-111, New Oxford Street, W.C.1.—July stock list of motors, dynamos, &c.

THE ENGLISH ELECTRIC CO., LTD., Queen's House, Kingsway, W.C.2.—Three illustrated publications: No. 920—compound-filled armourclad switchgear; No. 924—dual-frequency motors, with special reference to the Central England Electricity Scheme; and No. 989—turbo-alternators of 8,000 kW and over.

THE BROMLEY-LANGTON ELECTRIC WIRE & INSULATOR CO., LTD., 34-35, Newman Street, Oxford Street, W.1.—A catalogue (priced in U.S. dollars) of resistance and other wires made by an American company.

THE HARLAND ENGINEERING CO., LTD., Alloa, Scotland.—A publication (X50/2803) containing numerous illustrations of alternators, motors, multi-stage pumps, borehole pumps, and other plant produced by the company.

British Trade with Poland.

A Warsaw correspondent of *The Times Trade and Engineering Supplement* reports that there is a pronounced tendency for Poland to import British goods directly instead of obtaining them through German middlemen. M. Henri Grossman, one of the leaders of Polish economic affairs, recently stated that there are many British specialities the quality of which is so superior to those of all rivals that they would invariably be given preference by the Polish buyer. Among the goods which Poland prefers to obtain from England are motors, dynamos, and domestic electrical appliances.

Electric Launches at Great Yarmouth.

A number of electrically-driven launches are being constructed by Messrs. J. W. BROOKE & CO., LTD., Lowestoft, for the Great Yarmouth Corporation. The launches will be used on the new Yarmouth artificial pleasure waterways, and measure 20 ft. in length, with a beam of 7 ft. 6 in. and draught of 18 in. Singe 1.5-h.p., 40-V, d.c. motors by Metropolitan-Vickers are used for propulsion, operated by waterproof drum-type controllers with forward, reverse, and neutral positions. Energy is supplied from 40-V "Exide" batteries, which, it is understood, will be charged from a small plant situated on the waterside. The travelling speed is from 4 to 5 miles per hour.

German Radio Exports.

The *Wireless Trader* says that Germany's exports of radio apparatus during 1927 amounted to £2,099,000, as compared with £1,580,000 in 1926. This is the highest figure yet reached by any country and puts Germany in front of the United States in this trade.

The S.W. & S. Circle.

The group depicted herewith is the E.D.A. Circle formed to carry on co-operative electrical activity in the area of the Shropshire, Worcestershire and Staffordshire Electric Power Co. The members are principally electrical installation con-

The S.W. & S. Circle.

tractors from all parts of the area of 1,600 sq. miles in which the company operates. The photograph was taken outside the canteen of the company's chief office, Mucklows Hill, Halesowen.

New Italian Companies.

Among the electrical undertakings recently organised in Italy are the Società Illuminazioni e Distribuzione Energia Elettrica, Mazara del Vallo, capital 632,000 lire; La Società Imprese Veneti Eletromeccaniche, Varese, 100,000 lire; and La Società Italiana di Elettricita e Trazione, Milan.

A Correction.

In the note recording the registration of Berry's Electric (1928), Ltd., in our last issue, Mr. A. Shelton's name was incorrectly given as "Skelton"

Trade Announcements.

Messrs. JOHN W. MURDOCH & Co., electrical and wireless engineers, 19, River Street, Ayr, have altered their name to Murdoch, Anderson & Co.

The spare parts business formerly handled by Edison Accumulators, Ltd., has been taken over by ELECTRICARS, LTD., Lawley Street, Birmingham, where, as also at their London depôt at 18a, Stourcliffe Street, Edgware Road, W.1, spare parts are carried for electric vehicles and trucks.

The partnership of Messrs. E. F. DAGLISH and W. L. LORKIN has been converted into the Equipment and Engineering Co., Ltd., a private company with the two partners as joint managing directors. Messrs. W. T .Robson and A. Vickers, who have been associated with the firm for many years, have been elected directors, together with Mr. P. V. Fearon, late of the Brush Electrical Engineering Co., Ltd.

Mr. S. R. TAMPLIN has left the London Power Co., Ltd., to take up duties with Siemens-Schuckert (Great Britain), Ltd., where he will pay special attention to the heat economy and measuring instruments manufactured by this firm.

Messrs. R. PREECE & SONS, of Southend, Ledbury, have opened an electrical department in connection with their business.

ABELL & SMITH'S ELECTRICAL CO., LTD., is opening premises at High Street, Pershore, Worcestershire, and ask for lists, &c.

The DAWLISH ELECTRIC LIGHT & POWER CO., LTD., has removed its offices to 7 and 9, Brook Street, Dawlish, and has opened showrooms at that address. New showcards and lists are asked for.

Great Britain's Radio Exports.

During May, according to the *Wireless Trader*, the exports of radio apparatus from this country had a value of about £97,000 (including valves worth £20,000). Australia was by far the largest purchaser, the goods shipped to that market being valued at £15,063 (valves £7,280). Bulgaria is credited with a share of £10,639 (valves £1,098), while the next in order were the Netherlands, £9,454 (valves £50; Italy, £6,688 (valves £41); France, £5,557 (valves £45); and India and Burma, £5,153 (valves £318). The United States' share of £3,193 was about three times that of April.

Social Events.

The annual outing of the employés of the Metropolitan Electric Cable & Construction Co., Ltd., took place on June 30th, when a party of 130 proceeded from Chadwell Heath to Margate. Luncheon was taken at the Dreamland Hall, Mr. James Miller being in the chair, supported by the managing director, Mr. W. Brown. The return journey was commenced at 6.30 p.m.

The staff of Siemens Lamp Works, Preston, have recently held two golf competitions and a bowling handicap. Each of the events, which attracted excellent entries, took place at the Dick Kerr Club, Ashton Park, Preston. In the "S. H. Callow" golf competition (18 holes medal play), Mr. W. T. Le Marechal was the winner, with Messrs. W. G. Lochhead and W. G. Creasy second and third respectively. The "W. O. Smith" competition took the form of 2-ball foursomes, the successful pair being Messrs. J. N. Aldington and W. G. Creasy, followed closely by Messrs. P. D. Oakley and A. G. Ogles. The bowling handicap, in which practically all the male employés participated, was won by Mr. C. Parker, Mr. T. Woods being second.

The ninth annual sports and children's outing, organised by the staff of the Yorkshire Electric Power Co., and supported by the company, was held on July 7th, at the Thornhill Rectory grounds. Beautiful weather prevailed, and the entrance to the spacious grounds and the running course were suitably bedecked with bunting. There were 1,200 persons present. The prizes were presented by Mrs. Woodhouse, to whom a beautiful bouquet was handed by one of the children of the company's staff. Mr. Woodhouse, in responding to a vote of thanks, said that the company continued to grow, and he believed that the good work which it was doing in taking electricity all over the county would in the long run help to bring back prosperity to Yorkshire, and England as a whole. Mr. J. J. H. Stansfield, the secretary of the company, and Mrs. Stansfield were also present.

The Metropolitan-Vickers (Sheffield) Sports Association held its fifth annual sports and gala on the Sports Ground, Tinsley, on June 30th. There were 584 entries. Some excellent races were witnessed by nearly two thousand spectators, and at the conclusion the prizes were presented to the winners by Mrs. Bailey, wife of Mr. G. E. Bailey, a director of the company. Mr. G. H. Nelson, works manager, was again present, together with Mrs. Nelson. After the sports a dance was held in the pavilion.

Unemployment.

During the week ended July 2nd there was an increase of 24,940 in the number of registered unemployed. At that date the total was 1,217,500, as compared with 1,192,560 on June 25th, and with 1,053,576 on July 4th, 1927.

The Royal Norfolk Show.

The Norwich Corporation Electricity Department had a large display at the Royal Norfolk Show which was held at the end of June. Its stand was 50 ft. square and was divided up into compartments to show off various uses of electricity. Our illustration depicts the main domestic section in which cooking demonstrations were given on cookers similar to those

Electricity at the Royal Norfolk Show.

which the Department lets out on hire. Wash boilers, lighting fittings, &c., are also to be seen. Another compartment was fitted up as a bathroom with a water heater of the pattern used in the Department's hiring scheme. There was a special display of milking by electricity, and many kinds of electrically-driven farm appliances were exhibited.

New Belgian Company.

A new company has been formed in Brussels (61 Boulevard Poincaré) with a capital of four million francs and the title La Société "Electric" Fournitures Générales pour l'Electricité l'Industrie et l'Automobile.

The Factory Lighting Campaign.

The British Electrical Development Association has sent us some further preliminary particulars of the Factory and Workshop Lighting Campaign, which it is conducting, in conjunction with the Electric Lamp Manufacturers' Association, from September to November. It is pointed out that a recent survey disclosed that about 70 per cent. of our factories and workshops are inadequately lighted, and that insufficient lighting means reduced output, inferior production, greater risk of accident, and discontented workers. The Campaign is directed towards the banishment of bare lamps; the replacement of obsolete equipment; the modernisation of wiring installations; and the increasing of illumination intensities. The methods of conducting the Campaign are to be as follows: The sending of five successive postal communications, comprising letters and educational publications to 100,000 factories and workshops; the circulation of information on the lighting of textile, printing, engineering, and other specialised trades; the circulation of "better-lighting" literature within the electrical industry; service work by E.D.A. Committees, Circles and District Officers; the insertion of advertisements in national trade journals and papers; the publication of articles in the Press; and the co-operation of electricity supply authorities, manufacturers, contractors, and wholesalers.

Swiss Electrical Exports.

The exports of electrical machinery from Switzerland during the first quarter of the current year attained a value of £272,600, as compared with £262,600 in the corresponding period of 1927. Spain, Belgium, Germany and Japan were the principal markets. The exports of Swiss-built electric locomotives advanced during the same periods from £5,320 to £103,200, the chief customers being India, the Dutch East Indies, and Spain.

Deed of Assignment.

R. J. ROBINSON (R. J. Robinson & Co.), electrical engineer, Brackenborough Road, Louth, Lincs.—Last day for proofs for dividend July 31st. Trustee, Mr. A. Cripwell, 12, Cherry Street, Birmingham.

The F.B.I. and the Mond Conference.

After considering the report published by the Conference on Industrial Reorganisation and Industrial Relationships (*vide* our last issue, p. 59), the Grand Council of the Federation of British Industries has expressed its approval of the prime objects of the Conference and is appointing a committee, representative of all the industrial groups of the Federation, to investigate the proposals and matters involved and report to the Grand Council. The Committee is authorised to confer with the National Confederation of Employers' Organisations; to take steps to test the views of members of the F.B.I.; and to consult with Lord Melchett and his colleagues on their proposals.

The Marking of Imported Copper.

On July 23rd and 24th the Standing Committee (General Merchandise) appointed by the Board of Trade under the Merchandise Marks Act, 1926, will hold an inquiry as to whether the following goods shall be marked with the name of the country of origin upon importation into this country:—Copper plates, sheets, strips and other rolled sections; rods and wire (other than insulated wire); and tubes. The inquiries will be held at the B.O.T. Offices, Great George Street, S.W.1, and communications should be sent to the secretary, Mr. E. W. Reardon, at that address.

Book Notices.

"Educational Broadcasting." Pp. 40+80. Dunfermline, Fife: Carnegie United Kingdom Trustees.—This report on a special investigation in the County of Kent during 1927 should be of value to education authorities which have been waiting for guidance before adopting broadcasting as a normal adjunct to the school curriculum. For the purpose of the inquiry, to the cost of which a sum of £300 was contributed by the Carnegie Trustees, wireless receiving sets were installed in 62 elementary schools of all types in Kent, and upon the evidence of teachers, obtained by means of questionnaires, the report contains definite conclusions.

"Nickel and Nickel-Chromium Steels." (8 pp.). London: The Bureau of Information on Nickel, Ltd.—This is the first of a series of pamphlets upon the subject named in the title and consists of a general survey of the properties and principal applications of nickel-steel, &c.

"The Mond Nickel Bulletin," July, 1928. Vol. I, No. 1. London: The Mond Nickel Co., Ltd. (Research and Development Department).—This is the first appearance of a review of the current literature upon nickel and its alloys and their applications. The abstracts and references cover a wide field and include matters of all kinds into which nickel enters. The patent section is of interest.

"Report of the Council to the Members of the Institute, 1928." (78 pp.). London: City and Guilds of London Institute.

"Post Office Electrical Engineers' *Journal*." Vol. XXI. Part 2. July, 1928. London: ELECTRICAL REVIEW, Ltd. Price 1s. 3d. net.

"Illustrated Technical Dictionaries." Edited by Alfred Schlomann. We are informed that Messrs. Lewenz & Wilkinson, Ltd., will shortly be issuing and stocking for immediate delivery the revised and enlarged edition of Volume II on "Electrical Engineering," which has been completely rewritten and greatly extended. It includes complete chapters on Electrochemistry, Electromedical Applications, and Electro-optics. Further new volumes in preparation will deal with the art of communications (including wireless), mining, aeronautics, and chemistry.

Prices of Raw Materials.

Messrs. F. Smith & Co. report, July 17th: Copper (electrolytic) bars, £69 5s., 5s. inc.; ditto ditto sheets, no change; ditto ditto wire rods, £79 5s., 5s. inc.; ditto ditto h.c. wire, 9 15/16d., 1/16d. inc.

Messrs. James & Shakespeare report, July 17th: No change in the prices of copper and lead.

Messrs. Edward Till & Co. report, July 17th: India-rubbe,r Para fine, 11½d., ½d. inc.

In their letter dated July 14th, Messrs. James Forster and Co. stated that closing prices on July 13th were practically unchanged on the week. The downward movement in values was continued at the beginning of the week, but since then there has been a small recovery. The price in New York was marked down on July 9th to 6.20 cents per lb. Quiet conditions prevail in the market, and arrivals up to date this month are rather short, but with two or three steamers just docking with a considerable quantity, all requirements are likely to be satisfied for the time being. There appears to be no prospect of much change in prices, although a probable further cut in the New York price may have a depressing effect on the London market.

Lighting and Power Notes.

Bristol.—LOAN.—The Corporation Electricity Committee is applying for sanction to the borrowing of £25,000 for the equipment of sub-stations on consumers' premises.

Burton-on-Trent.—LOAN SANCTIONED.—The Corporation Electricity Committee has obtained sanction to borrow £40,000 for the extension of the boiler house at the electricity works.

Douglas (I. of Man).—LOAN SANCTIONED.—The Corporation Electricity Committee has obtained sanction to a loan of £69,417 for electricity extensions.

East Ham.—LOAN SANCTIONED.—The Corporation Electricity Committee has obtained sanction to a loan of £4,254, for extensions of distributor cables.

STREET LIGHTING.—The Committee has reported in favour of the suggestion of the engineer that the charges for electricity supply for the lighting of main streets be reduced from 2d. to 1½d. per kWh, and that 75-watt lamps be substituted for 60-watt lamps in side streets.

YEAR'S WORKING.—The accounts of the Corporation electricity undertaking (engineer, Mr. W. R. Elliott) for the year ended March 31st last show a total income of £107,333, and working expenditure of £66,293, leaving a gross profit of £41,040. The previous year's figures were: Income, £104,190; working expenses, £74,857; gross profit, £29,333. After payment of capital and other charges there was a net surplus of £16,807, as compared with £2,857 in the preceding year. A contribution of £1,303 was made to the borough fund. The capital expenditure during the year was £25,809, the bulk of which was spent on cables. The electrical energy sold increased from 8,002,029 to 9,584,340 kWh, and the average price obtained per kWh fell from 3.125d. to 2.685d.

Eston.—LOANS.—The Urban District Council Electricity Committee is to apply for sanction to loans of £1,000 for meters, and £1,000 for rental wiring installations.

Exeter.—LOANS.—To cope with the continued development of the undertaking, the Electricity Committee has recommended to the City Council that application be made for sanction to the borrowing of £43,000 in respect of mains and services, £7,000 for transformers and switchgear, to cover the needs for the next three years, and £4,000 for the purchase of domestic cookers to be let out on hire.

STREET LIGHTING.—The Lighting Committee has adopted the proposals of the electrical engineer for an improvement in the lighting of the city's main streets. These involve the installation of 28 extra lamps of 600 c.p. and certain readjustments of the existing lamps at a first cost of £197, and an additional annual cost of £290. The engineer states that by this arrangement the average lighting of the principal thoroughfares will be doubled and brought more into line with modern standards.

Great Yarmouth.—YEAR'S WORKING.—The accounts of the Corporation electricity undertaking (engineer, Mr. P. G. Campling) for the year ended March 31st last show a total income of £81,860, as compared with £68,340 in the preceding year. Working expenses were reduced from £38,935 to £33,900, leaving a gross profit of £47,960 (£29,405), to which was added revenue from other sources, making a total of £53,278. After payment of capital charges there was a net surplus of £8,773, as compared with £335 in 1926-27. The amount spent on capital account during the year was £84,868, and included £38,534 for machinery, and £12,760 for mains and services. The sales of electricity increased from 4,603,704 to 5,673,627 kWh, and the maximum supply demanded from 3,459 to 3,850 kW.

Hastings.—LOANS.—The Corporation Electricity Committee has received sanction to the borrowing of £702 for mains, £30,384 for building work, and £464 for switchgear. Application is being made for sanction to a loan of £10,000 for the rental wiring and hire-purchase scheme.

Japan.—ELECTRICAL DEVELOPMENT.—The Daido Electric Power Co. is to erect three hydro-electric power stations. The Maruyama station will have a capacity of 20,290 kW, No. 1 Futamata station, 4,688 kW, and No. 2 Futamata station, 23,450 kW. The cost of construction is estimated at 21,000,000 yen.

The Kyushu Electric Railway Co. is to increase the capacity of its Kokura steam power station from 33,750 kW to 68,750 kW, by the installation of one 35,000-kW set.

Kirkcaldy.—YEAR'S WORKING.—The report on the working of the burgh electricity undertaking (engineer, Mr. O. F. Francis) for the year ended May 15th last shows a total revenue of £52,101, as compared with £62,415 in the preceding year. Working expenses decreased from £43,968 to £26,927, leaving a gross profit of £25,174, as against £18,447. After deducting capital charges there was a net surplus of £6,381, as compared with £548 in 1926-27. The capital expenditure during the year amounted to £46,690, the bulk of which was spent on mains. The electrical energy sold fell from 8,597,169 to 8,396,186 kWh, the decrease being due to the loss of a large power consumer. The maximum supply demanded rose from 3,580 to 3,720 kW, and the average price obtained per kWh decreased from 1,738d. to 1.486d.

Liverpool.—EXTENSION OF SUPPLY.—The City Council is to carry out extensions of h.p. and l.p. mains for the development of electricity supply in the Halewood and Netherton districts at an estimated cost of £2,323 and £6,054 respectively, and application is to be made for Fringe Orders.

Montrose.—ELECTRICITY SUPPLY.—The Grampian Electricity Supply Co. has written the Town Council stating its intention to erect electric lines in the burgh in connection with the East Forfarshire development. The lines, partly overhead and partly underground, will be used for transmitting electricity at a pressure of 11,000 V. The Council has approved the scheme.

Oxford.—ELECTRICITY CHARGE.—The Corporation reports that an Order made by the Minister of Transport reducing the statutory maximum price for electricity in the city to 8d. per kWh has been received.

Portsmouth.—YEAR'S WORKING.—The report of the borough electrical engineer (Mr. B. Handley) on the working of the electricity undertaking for the year ended March 31st last records a total revenue of £232,207, as compared with £234,163 in 1926-27. Working expenses decreased from £175,507 to £145,189, leaving a gross profit of £87,018 (£58,655). After deducting capital charges there was a net surplus of £13,042, as compared with £2,144 in the previous year. A contribution of £2,000 was made to the borough fund. The amount spent on capital account during the year totalled £59,448, and included £25,065 for machinery, and £24,678 for mains and services. The sales of electrical energy amounted to 25,285,858 kWh, and the maximum supply demanded was 13,200 kW.

Price Reductions.—Reductions in the charges for electricity have been made or recommended in the following districts:—

MAIDENHEAD.—Ordinary rental flat rate for lighting: A reduction of ¼d. per kWh; secondary rental charge under the two-part tariffs, a reduction of ¼d. per kWh.

LEEK.—Lighting, power and kinema motor generators: A reduction of ¼d. per kWh. Domestic heating and cooking: A reduction of ¼d. per kWh. A discount of 10 per cent. for prompt payment of accounts.

CHESTERFIELD.—Electricity to small consumers: A reduction of ¼d. per kWh. Meter rents: A reduction of 50 per cent.

WEYMOUTH.—Lighting: From 6¼d. to 6¼d. per kWh, with discount. Power: From 1¼d. to 1¼d. per kWh.

MOLD.—Lighting: From 8d. to 7d. per kWh.

HAZEL GROVE AND BRAMHALL.—Lighting: From 7d. to 6d. per kWh. Domestic power: From 2d. to 1¾d. All meter rents abolished.

ALDERSHOT.—Ordinary lighting: From 7d. to 6d. per kWh; prepayment meters, from 10d. to 8d. per kWh. Factory and outside lighting: From 5d. to 4d. per kWh. Kinemas, &c.: From 7d. per kWh for the first 100 kWh per week and 3½d. beyond, to 6d. and 3d., respectively. Public lighting: From 5d. to 4d. per kWh. Power: From 4d. and 2d. to 3d. per kWh for the first 1,000 kWh per quarter, 2½d. for the next 1,000 kWh, 2d. for the next 1,000 kWh, and 1½d. per kWh beyond. Heating and cooking: From 2d. to 1d. per kWh.

Rothesay (Bute).—ELECTRICITY SUPPLY.—The Town Council is to invite tenders for an additional generating set with a minimum capacity of 200 kW, and a third engine will probably be required in a year. The agreement under which the local tramway company supplies part of the burgh's electricity requirements expires in May next. The Glenburn Hydropathic is inquiring for a quotation for a minimum supply of 30,000 or 35,000 kWh per annum.

Skipton.—ELECTRICITY SUPPLY.—The Electrical Distribution of Yorkshire, Ltd., has intimated to the Rural District Council that it is proceeding as rapidly as possible with the scheme for the supply of electricity in the Airedale portion of the Council's district. A bulk supply will be taken from the Yorkshire Electric Power Co., which has already established a system of mains and sub-stations in a part of the district from which extensions can be made immediately.

South-West Midlands Advisory Joint Committee.—ANNUAL REPORT.—The South-West Midlands Advisory Joint Committee (Electricity Supply), of which Mr. H. K. Beale (Birmingham) has been chairman since the committee was established in 1923, has just made its annual report to the Electricity Commissioners. The district over which the Joint Committee exercises jurisdiction comprises an area of upwards of 1,300 sq. miles. The total generating plant capacity installed in the power stations of supply authorities in the district amounts to 243,078 kW. A gratifying feature of the report is the much lower consumption of fuel per kWh, the improvement being 17½ per cent. The report records considerable progress during the year with extensions of the distribution systems in the undeveloped parts of the district, and states that some twenty small towns and villages in Worcestershire and Warwickshire have been afforded supplies during the year. There has been an increase of 21 per cent. in the number of consumers, and a 20 per cent. increase in the total quantity of electricity sold. The energy sold per head of population now amounts to 228 kWh, as compared with 191 in the previous year. The link main between Birmingham and the Shropshire, Worcestershire and Staffordshire Electric Power Co.'s Stourport station has been put to substantial use during the year for interchange of supplies between the two authorities.

South-East Lancashire Electricity Advisory Board.—ANNUAL REPORT.—We have received a copy of the annual report of the proceedings of the Board for the year ended March 31st last. During the year bulk supply contracts between the Lancashire Electric Power Co. and the Corporations of Leigh and Eccles were approved, and the Electricity Commissioners sanctioned the erection by the company of a new power station at Kearsley. Approval was given by the Board to plant extensions at Altrincham, Bury, Buxton, Macclesfield, Salford, Stalybridge and Stockport, and the construction of 33,000-V transmission lines by the Lancashire Electric Power Co., Manchester and Rochdale Corporations, and Stretford Urban District Council. Ashton-in-Makerfield Urban District Council and the Mid-Cheshire Electricity Supply Co., Ltd., became constituent members of the Board. Special Orders or proposals to take out Special Orders were submitted by the following authorities:—Electricity Company of Macclesfield, Ltd., Manchester and Wigan Corporations, the Urban District Councils of New Mills and Marple, and a combined application by a number of authorities for the constitution of the Alderley Edge and Wilmslow Electricity Board. A number of applications for Fringe Orders were supported by the Board. The consumption of electricity in the area increased from 729,617,774 to 837,206,978 kWh. Based upon the estimated population for 1927, the energy sold per head amounted to 273 kWh. The cost of administration for the year amounted to £2,785, which, when distributed over the energy sold, yields a figure of 0.00079d. per kWh, as compared with 0.00080d. in the previous year.

MANCHESTER TRANSMISSION LINE.—The Engineering Advisory Committee has recommended the Board to approve the provision of a 33,000-V main between High Street and West Didsbury by the Manchester Corporation, at a cost of £26,500.

MACCLESFIELD.—The Committee has decided to raise no objection to the change-over in the system of electricity supply by the Electricity Company of Macclesfield, Ltd., from 460/230 V d.c. to 400/230 V, 3-phase, 50 cycles, a.c. In connection with the company's application for a Special Order authorising it to supply electricity in Bollington urban district and part of Macclesfield rural district, the Committee has recommended the Board to support either the Special Order, if adjusted or amended in certain respects, or alternatively, a Special Order limited to the added areas carrying out such adjustments or amendments.

FRINGE ORDERS.—Applications for Fringe Orders have been made by Wigan and Heywood Corporations, and the Cheadle and Gatley Urban District Council, and these have been passed to the Board for its approval.

The minutes of the proceedings of the Engineering Advisory Committee have been approved and adopted by the Board.

Special Order.—The Electricity Commissioners have submitted to the Minister of Transport for confirmation a Special Order made by them authorising the Leicestershire and Warwickshire Electric Power Co. to supply electricity in the rural district of Monks Kirby and parts of the rural districts of Foleshill, Meriden, Nuneaton, Rugby, and Warwick.

Tonbridge.—ELECTRICITY SUPPLY.—The Urban District Council has decided to carry out mains extensions, at a cost of £4,316, and to lay a new feeder at a cost of £1,100, in order to give a further supply of electricity to the Acme Chemical Co. The Council has also decided to supply electricity to the Redcar Services, Ltd., at the reduced charge of 2d. per kWh, with a minimum annual payment of £160, instead of at 2½d. per kWh, with a minimum payment of £200 per annum.

Torpoint.—STREET LIGHTING.—The Urban District Council has decided to enter into a contract with the Torpoint Electric Supply Co., for the supply of electricity for public lighting over a period of five years, at a cost of 6d. per kWh.

West Hartlepool.—YEAR'S WORKING.—The accounts of the Corporation electricity undertaking (engineer, Mr. J. H. Parker) for the year ended March 31st last record a total income of £70,631, as compared with £52,862 in 1926-27. Working expenses amounted to £44,314, as against £44,807, leaving a gross profit of £26,316 (£8,055), to which was added revenue from other sources, making a total of £26,907. Capital charges absorbed £9,634, and there was a net surplus of £9,238, as compared with a deficit of £8,375 in the preceding year. The Electricity Committee has recommended that £1,900 from the surplus be contributed to the rates, and that the remainder be placed to reserve. The capital expenditure during the year amounted to £27,744, and the total now expended on the undertaking stands at £300,377.

Weymouth.—LOANS SANCTIONED.—The Corporation Electricity Committee has received sanction to loans of £10,000 for mains and services, and £41,000 for extensions of plant and buildings.

Tramway and Railway Notes.

Bristol.—PROPOSED PURCHASE OF UNDERTAKING.—The Corporation has appointed a Special Committee to consider and report upon the desirability or otherwise of purchasing the tramway undertaking.

Continental.—BELGIUM.—Further electrification work has been completed on the system of the Société Nationale des Chemins de Fer Vicinaux, and electric trains are now being run between Ostend and Nieuport, and between Westende, Lombartzyde, and Nieuport. Plans are also being prepared for the extension of the electric railway from La Panne to the French frontier, which, when completed, will afford a direct service between Ostend and Dunkirk. On the northern side of Ostend an electric-train service has been inaugurated between Zoute, Lekkerbek, and Siska.

East Ham.—YEAR'S WORKING.—The accounts of the Corporation tramway undertaking (manager, Mr. W. R. Elliott) for the year ended March 31st last show a total income of £108,940, as compared with £92,856 in the preceding year. Working expenses amounted to £97,406, as against £97,352, leaving a gross profit of £11,534, as compared with a gross loss of £4,496. After payment of capital charges and rental of leased lines there was a net deficit of £15,900, as compared with £30,543 in 1926-27. The capital expenditure during the year amounted to £41,714, and was made up of £17,113 for permanent way and £24,601 for cars. The number of passengers carried increased from 17,211,808 to 18,789,140, and the car miles run from 1,685,575 to 1,782,277. The total revenue per car mile rose from 12.84d. to 13.76d.

Japan.—ELECTRIC RAILWAYS.—The Kaga Electric Railway Co., Ltd., is in course of formation for the construction of an electric railway between the port of Kaga and the city of Matsuye.

The Railway Department has granted charters for the construction of the following new railways:—The Ensan Electric Railway from Ishimaki-mura to Toyokawa-machi, Aichi-ken, at a cost of 570,000 yen; a railway in Toyama-ken, 10 miles in length, to be constructed by the Hokuriku Kogyo K.K.; and the Ofu Connection electric railway, eight miles in length, in Fuchu-machi, Hiroshima-ken.

Kirkcaldy.—YEAR'S WORKING.—The accounts of the burgh tramway undertaking (manager, Mr. O. F. Francis) for the year ended May 15th last record a total revenue of £31,905, as compared with £32,941 in the preceding year. Working expenses amounted to £25,802, as against £26,170, leaving a gross profit of £6,103 (£6,771). After payment of capital charges there was a net deficit of £591, as compared with a loss of £9 in 1926-27. The number of passengers carried increased from 5,218,460 to 5,272,174, and the car miles run from 434,261 to 447,010. The average revenue per car mile fell from 18.205d. to 17.13d.

Liverpool.—EXTENSION OF TIME.—The Corporation has applied to the Minister of Transport for the prolongation of the time prescribed for the commencement or completion of tramways authorised under the Corporation Tramways Order, 1925, until July 31st, 1929.

Southport.—YEAR'S WORKING.—The report on the working of the Corporation tramway undertaking (general manager, Mr. T. J. Kendrew) for the year ended March 31st last shows a total revenue of £75,057, and working expenses of £57,756, leaving a gross profit of £17,300. The figures for the preceding year were: Income, £72,373, working expenses, £54,195; gross profit £18,178. After providing for capital charges there was a net surplus of £3,544, as compared with £1,922 in the previous year. The number of passengers carried increased from 12,812,533 to 13,489,878, and the car miles run from 1,103,142 to 1,186,337. The total revenue per car mile fell from 15.746d. to 15.184d.

Walsall.—YEAR'S WORKING.—The report on the working of the Corporation tramway undertaking (general manager, Mr. W. Vane Morland) for the year ended March 31st last records a total revenue of £78,337, as compared with £76,905 in 1926-27. Working expenses were £60,271, as against £59,982, leaving a gross profit of £18,066 (£16,923). Loan charges absorbed £12,387, and there was a net surplus of £5,679, as compared with £4,676 in the preceding year. The number of passengers carried was 11,698,189, the car miles run 1,071,676, and the average total revenue per car mile, 17.543d.

Wolverhampton.—YEAR'S WORKING.—We have received from Mr. C. Owen Silvers, general manager and engineer of the Corporation transport undertaking, a copy of the report covering the year ended March 31st last. The railless-car service shows a total revenue of £106,891, as compared with £45,285 in the preceding year. Working expenses amounted to £69,389, as against £34,877, leaving a gross profit of £39,502 (£10,408). The tramway section of the undertaking recorded a total income of £29,830, as compared with £70,429 in 1926-27, and working expenditure of £17,065, as against £48,496, leaving a gross profit of £12,765 (£21,933). This was carried to net revenue account together with the gross profit from the railless-car service, a balance of £29,622 from the motor-omnibuses, bank interest of £835, and £347 being a contribution by Wolverhampton District Electric Tramways, Ltd., towards capital charges in respect of through-running agreement, making a total of £83,070. Capital and other charges absorbed £57,151, and there was a net surplus of £25,919, as compared with £14,671 in the previous year. The capital expenditure during the year amounted to £70,221, the chief items being £30,137 for railless cars, and £26,369 for road reconstruction on old tramway routes. The number of passengers carried by the railless-car and tramway services increased from 20,589,301 to 21,812,091, and the car miles run from 1,599,825 to 1,831,905. Further progress was made during the year with the scheme for the supersession of the tramway by railless cars or motor-omnibuses.

Telegraph and Telephone Notes.

Mexico.—TELEPHONE SERVICE.—The Mexican Telephone Company Ericason, an affiliated concern of the Swedish L.M. Ericsson Telephone Company, reports an increased net profit of 1.17 million kronor for the past year, against 1.13 millions in 1926, and has declared an unchanged dividend of 10 per cent. During the past year the concern developed its activity considerably, the number of telephones in Mexico City having increased by 2,887 to 24,268. The company during the past year purchased the entire telephone service of Vera Cruz, which has been connected with that of Mexico City by trunk lines; the telephone services in the cities of Torreon and Cuernavaca have also been absorbed. The gross revenue of the telephone traffic has risen from 4.14 to 4.30 million kronor and the book value of the entire installations from 12 to 13.52 million kronor.

Sweden.—TELEPHONE SERVICE.—The Swedish State Telephone and Telegraph Department states in its annual report that the use of telephones is gradually increasing. In the city of Stockholm there are roughly 29 telephones per hundred inhabitants, which figure is surpassed only in America, where San Francisco leads with 31 per hundred. The number of telephones increased during the year by 15,000 to a total of 453,500 in the entire country, and 79 new exchanges were opened during the year. The capital invested in the Department was about 310,000,000 kronor, and the net profit was 6.48 per cent. The rapid growth of Sweden's international interests is evinced by the extension of the foreign telephone connections during the past year to Belgium, France, and Great Britain, and by a considerable increase in the number of foreign telephone calls and telegrams. The combined length of new telephone lines constructed during the year amounted to 30,000 kilometers, and the automatising of the Stockholm and Gothenburg services is proceeding rapidly.

Switzerland.—LEAGUE OF NATIONS RADIO STATION.—The original proposal for a purely League station on neutral territory has been reconsidered, says *The Times*, and a special committee formed to analyse the situation will submit to the Council, alongside the original proposal, a new one whereby, instead of the League being saddled with the definite initial expenses and the problematical working expenses of a station of its own, the acceptance is recommended of the offer of Radio-Suisse (a commercial wireless organisation in which the Swiss Government is largely interested, now operating the Berne station) to construct in the Canton of Geneva a special wireless telegraph station equipped with the latest appliances, which will be placed at the service of the League in times of crisis.

The Telephone Service.—ROCHDALE AUTOMATIC AREA.—The recent conversion of the Rochdale telephone area to automatic working involved the cut-over of eight new exchanges with a total of 3,880 lines. The "step-by-step" system of Standard Telephones & Cables, Ltd., has been installed, similar to that which was recently cut over at Macclesfield, the application of which to a multi-exchange area introduces interesting features in the trunking arrangements between automatic exchanges. In the small satellite exchanges (Whitworth, Milnrow, Norden, and Castleton) there are no group selectors: all calls are routed through the group selectors in Rochdale main. This means that for local calls two junctions are used between the satellite

and the main exchange, but traffic conditions warrant this arrangement and it effects economy in the satellite equipment. At the three larger satellites (Littleboro, Shaw and Heywood) a discriminating selector repeating scheme is installed.

United States.—TELEGRAPH MERGER.—The merging of the Mackay Companies with the International Telephone and Telegraph Corporation as the "Postal Telegraph and Cable Corporation" has been completed. Mr. Clarence Mackay is chairman and Mr. Sosthenes Behn president, respectively, and it was expected that trading in the new corporation's $30,000,000 7 per cent. preferred stock and also the $52,000,000 5 per cent. Gold Bonds would begin last week.

Radio Notes.

Africa.—WAVELENGTHS.—It was announced last week that the Algiers station had changed its wavelength from 304 to 353 metres.

The British East African Broadcasting Co.'s Nairobi station, Kenya Colony, operates on a wavelength of 90 metres, its power being approximately 4 kW.

Battery Eliminators.—WESTMINSTER BAN.—It is understood that the Westminster Electric Supply Corporation, Ltd., London, has issued a circular notice to the effect that "no authorisation has been given for the use of its lighting or power circuits in connection with wireless sets. In the event of the Corporation desiring to change the supply to any premises from d.c. to a.c., it will not pay the cost of making any necessary changes to wireless sets so connected."

Ceylon.—LICENCES.—Amongst Government efforts that are being made to encourage the use of portable wireless sets is the removal of the import duty on privately-owned sets, so that any person may now import a set and possess it for six months without a licence.

Hungary.—RAILWAY STATION RECEPTION.—A Railway Broadcasting Company has recently been formed in Budapest for the purpose of providing loud-speaking broadcast receiving apparatus in railway station waiting rooms.

Sweden.—LICENCES.—Radio broadcasting is growing by leaps and bounds, the number of licences for receiving sets issued during 1927 having increased from 242,000 to 328,000, or from 40 to 54 per thousand inhabitants.

Contract Information.

When "Contracts Open" are advertised in our "Official Notice" pages, the date of the ELECTRICAL REVIEW containing the advertisement is given in parentheses below.

Contracts Open.

Armthorpe.—July 26th. West Riding Education Committee. Electric lighting installation at new Council school. Specification from Education Department, County Hall, Wakefield.

Atherton.—July 31st. Urban District Council. E.h.p. cable. (July 13th.)

Australia.—MELBOURNE.—Electricity Commission of Victoria. August 6th. Neutral earthing compensator. (B.X. 4519.)*

August 20th. 66,000-V transformers and spares. (B.X. 4541.)*

September 10th. Synchronous condenser and accessory plant. (B.X. 4545.)*

October 31st. Water-tube boilers, with auxiliary and accessory equipment.

SYDNEY.—August 29th. N.S.W. Government Railways. Two 20,000-kW turbo-alternators and condenser plant for Ultimo power house.

September 12th. One 60-ton electric overhead travelling crane for Ultimo power station. Chief Electrical Engineer, 61, Hunter Street, Sydney.

Blackpool.—August 1st. Corporation. Electrically driven centrifugal pumps for sewage pumping. Mr. F. Wood, borough engineer.

Bromsgrove.—July 28th. Board of Guardians. Electric lighting installations at the workhouse infirmary and children's home. (July 13th.)

Dundee.—July 26th. Corporation Cleansing Department. Complete refuse disposal plant, including machinery for separation, two three-cell destructor units, boiler, chimney stack, storage bunkers, receiving hoppers, conveyors, &c. Specification (two guineas) from Mr. W. H. Sagar, cleansing superintendent.

Edinburgh.—July 23rd. Corporation. Structural steel work of coal bunkers in boiler house, extension at the electricity station, Westbank, Portobello. Schedules from city architect.

Egypt.—CAIRO.—October 3rd. General Management. Telephone trunk cable, Cairo-Alexandria. Specifications from Chief Inspecting Engineer, London, S.W.

Glasgow.—July 30th. Corporation. Installation of electric light, telephones, and fire alarms for two new wards at Knightswood Hospital. Specifications, &c., from Office of Public Works, 249, George Street.

Halifax.—July 30th. Town Council. Electrician's work (wiring only) required in erection of 94 houses, Moor End. Specifications (£2 2s. deposit) from Borough Engineer, Crossley Street.

India.—MADRAS.—August 14th. Madras and Southern Mahratta Railway Co., Ltd. A.c. motors and starting pillars, paper cables, terminal and joint boxes, rubber cables. (See this issue.)

Irish Free State.—DUBLIN.—August 14th. Electricity Supply Board. Overhead and underground distribution mains and services for Blackrock, Booterstown, Monkstown, Sandycove, and Dalkey. (See this issue.)

WATERFORD.—August 3rd. Corporation. 10,000-V and 400-V 3-phase and 200-V d.c. switchgear. (July 6th.)

London.—CENTRAL ELECTRICITY BOARD.—July 27th. South-East England electricity scheme. 33,000-V overhead transmission line between Brighton and Worthing. (June 29th.)

LONDON COUNTY COUNCIL.—July 23rd. Installing electric lighting, bells and power at the Weights and Measures Office, Euston Road. (July 13th.)

POPLAR.—July 25th. Board of Guardians. Two 25-h.p. electric motors with control panels, cable, &c. (See this issue.)

BETHNAL GREEN.—July 26th. Borough Council. Electric lighting installation at "Museum Buildings," Green Street, and "Ravenscroft," Columbia Road. (July 13th.)

METROPOLITAN ASYLUMS BOARD.—August 22nd. Rewiring fire alarm system at Caterham Mental Hospital. Installation of electric lighting in shore and pier buildings, Long Reach Hospital, Dartford, Kent. (See this issue.)

Lourenco Marques.—August 30th. Ports and Railways Administration. Electrolytic copper cable, r.i. copper wire, &c. (B.X. 4565.)*

Manchester.—August 14th. Tramways Committee. Sand-drying plant. Specification and form (deposit £1 1s.) from Mr. H. Mattinson, general manager and chief engineer, Corporation Tramways, 55, Piccadilly, Manchester.

New Zealand.—WELLINGTON.—September 11th. Public Works Department. Two 10-cwt. electric travelling indoor cranes. (A.X. 6545.)*

October 30th. Protective relay system. (B.X. 4573.)*

September 4th. Insulating tape. (B.X. 4572.)*

September 25th. Meter-testing equipment for Lake Coleridge. (B.X. 4570.)*

July 31st. Motor-generator for Seacliff Mental Hospital. (B.X. 4571.)*

Portland.—August 15th. Urban District Council. Mains, transformers, and meters. (See this issue.)

Renfrewshire.—August 3rd. Education Authority. Electric lighting installation at new school, Paisley. Schedules (deposit of £1) from Executive Officer, County Education Offices, 16, Glasgow Road, Paisley.

Ripon.—August 14th. Electricity Department. Transformers, e.h.p. and l.p. switchgear and cable connections. (See this issue.)

Salford.—August 13th. Electricity Department. One 20,000-kW turbo-generator set with condenser and auxiliaries. (July 13th.)

August 13th. Electricity Department. Two water-tube boilers with stokers, fans, motors, preheaters, &c. (See this issue.)

South Africa.—JOHANNESBURG.—South African Railways and Harbours. August 9th. Six electrically-driven overhead travelling cranes. (A.X. 6409.)* 50-kVA transformers and 2,100-V truck-type switchgear. (B.X. 4526.)*

CAPE TOWN.—City Council. August 15th. L.p. switchgear for Murzenberg, New Pavilion. (B.X. 4562.)*

UITENHAGE.—July 30th. Municipal Council. H.p. and l.p. switchgear, h.p. and l.p. cable, motors, fans, transformers, transformer kiosks, &c. (B.X. 4517.)*

BULAWAYO.—August 14th. Municipal Council. One water-tube boiler with chain grate, one turbo-alternator, spray cooling equipment with circulating water piping, one 3-panel switchboard. (A.X. 6454.)*

Uruguay.—August 22nd. State Electricity Department. Gasfilled metal-filament lamps. (B.X. 4560.)*

Warrington. — July 30th. Electricity Department. 12 months' supply of e.h.p. and l.p. cables; e.h.p. sub-station switchgear, and 12 months' supply of reinforced-concrete cable protector slabs, tiles and hard-burned red tiles. (See this issue.)

Willesden.—July 30th. Board of Guardians. New boiler and two 90-kW direct-coupled generating sets for the Park Royal Hospital. (See this issue.)

*Further particulars can be obtained at the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, S.W.1.

Contracts Closed.

Blackpool.—Tramways Department.
Twenty-two 50-h.p., 500-V tramcar motors.—General Electric Co., Ltd.

Bury.—Town Council. Accepted :—
Feed pumps for the electricity department.—Mather and Platt, Ltd.
Switchgear for sub-stations.—Ferguson, Pailin & Co., Ltd.

Bradford.—Electricity Committee. Accepted:—
Armourclad switchgear for Valley Road power station.—A. Reyrolle & Co., Ltd.
Baths Committee. Accepted :—
Electric lighting at Wyke baths (£91).—J. Carter.

Bury St. Edmunds.—Town Council. Accepted:—
Cable for lighting Perry's Barn (£342).—Callender's Cable and Construction Co., Ltd.

Colchester.—Electricity Committee. Accepted:—
Four switchboard panels (£109).—Electric Construction Co., Ltd.

Darlington.—Town Council. Accepted :—
Boiler for the electricity works at £13,500.—Babcock and Wilcox, Ltd.

Dartford.—Urban Council. Accepted :—
Feeder pillar (£100).—Johnson & Phillips, Ltd.

Dewsbury.—Town Council. Accepted:—
Cables.—Connolly (Blackley), Ltd. An amendment that an offer by a German firm at £120 less, with a discount of a further 10 per cent., should be accepted, was rejected by 13 votes to 12.

Falmouth.—Board of Guardians. Accepted :—
Wiring the institution for electric light (£280).—J. H. Deeble & Sons.

Glasgow.—Tramways Committee. Recommended :—
Special work.—Hadfields, Ltd.; Edgar Allen & Co., Ltd.; Titan Trackwork Company, Ltd.; and Thermit, Ltd.
Armature binding wire.—Bruntons, Ltd.
Rotary convertors for sub-stations.—One 500-kW, Harland Engineering Co., Ltd.; two 1,000-kW Crompton-Parkinson, Ltd.

Hastings.—Electricity Committee. Recommended :—
Electrically driven boiler feed pump (£298).—Stirling Boiler Co., Ltd.
Feeder panel extensions (£90), l.p. switchgear (£149), and switchboard panel, &c., for Grove sub-station (£886).—Ferguson, Pailin, Ltd.
Transformer and l.p. cubicles for extended supply area.—Ferranti, Ltd.

Hazel Grove and Bramhall.—Urban Council. Accepted :—
Electricity meters.—Ferranti, Ltd.

London.—LONDON COUNTY COUNCIL.—Education Committee. Recommended Wiring Henry Thornton School, Clapham, for electric lighting, bells and telephones :—

ALPHA MANUFACTURING & ELECTRICAL Co., Ltd. (Recommended.)	£1,149
Cox-Walkers, Darlington	1,170
H. J. Cash & Co., Ltd.	1,232
Alexr. Hawkins & Sons	1,295
Stegman & Co.	1,410
Electrical Installations, Ltd.	1,415
A. Dean & Co., Ltd.	1,496
Pinching & Walton	1,576
Berkeley Electrical Engineering Co.	1,616

Wiring Turin Street school, Bethnal Green, for electric lighting (£299).—Anderson, Angell & Co.

Housing Committee. Accepted :—
Lightning conductors at Hornsey Rise estate (£464).—R. C. Cutting & Co.

HACKNEY.—Electricity Committee. Condensing water works :—

C. V. BUCHAN & Co., LTD. (Recommended.)	£16,513
Mears Bros.	17,925
Demolition & Construction Co., Ltd. ...	17,999
Edwards Construction Co., Ltd.	18,244
W. & C. French	18,450
Geo. Bell & Sons, Ltd.	19,604
Walter Jones & Sons, Ltd.	20,442
Wm. Press & Son	22,426
Wm. Simms	23,350
Thomas Muirhead & Co., Ltd.	29,984

Finance Committee. Re-wiring the lighting and electric bell installations at the Town Hall :—

TROUGHTON & YOUNG, LTD. (Recommended.)	£465
J. H. Golding	529
Hackney Electricity Department	638
W. E. Westwood	655
Duncan Watson & Co.	658
H. J. Cash & Co., Ltd.	704
Tyler & Freeman	709
A. Gordemer	745

PORT OF LONDON AUTHORITY.
Six months' supply of gasfilled lamps.—Metro-Vick Supplies, Ltd.

SHOREDITCH.—Lighting Committee. Recommended :—
Electric light installations at the undermentioned dwellings :—Teale Street Dwellings, 60 tenements (£599), Haberdasher Street Dwellings, 67 tenements (£530), Block 9, L.C.C. Housing Scheme, Ware Street Area, 18 tenements (£370).—Electrical Installations, Ltd.

WAR OFFICE.
Twelve months' supply of "Mazda" vacuum and gasfilled lamps for the Southern Command, stations abroad, and the Chief Superintendent of Ordnance Factories.—British Thomson-Houston Co., Ltd.

ADMIRALTY :—
Resistance rods.—Edison Swan Electric Co., Ltd.

Leeds.—CORRECTION.—The second and third items under the heading "Leek" on p. 67 of our last issue related to Leeds.

Maidstone.—Exors. of the late W. Venn Carr.
Five 30-cwt. "Electricar" low loaders for refuse collection work.—Electricars, Ltd.

Manchester.—Electricity Committee. Accepted :—
Cables for 12 months.—British Insulated Cables, Ltd.; Johnson & Phillips, Ltd.; Pirelli-General Cable Works, Ltd.; W. T. Glover & Co., Ltd.; Power and Lighting Cables, Ltd.; Connollys (Blackley), Ltd.; Hackbridge Cable Co., Ltd.; Macintosh Cable Co., Ltd.; Greenwich Cable Works, Ltd.; Callender's Cable and Construction Co., Ltd.; Siemens Bros. & Co., Ltd.; Liverpool Electric Cable Co., Ltd.; Mersey Cable Works, Ltd.; Metropolitan Electric Cable and Construction Co., Ltd.; Edison Swan Cables, Ltd.; Standard Telephones and Cables, Ltd.; W. T. Henley's Telegraph Works Co., Ltd.; Ward & Goldstone, Ltd.
D.c. watt-hour meters.—Aron Electricity Meter, Ltd.
Single-phase a.c. meters.—Thompson & Co. (manufactured at Geneva), and Landis & Gyr, Ltd.
Polyphase meters.—Metropolitan-Vickers Electrical Co., Ltd.
Weldless-steel lamp columns and fittings.—British Mannesmann Tube Co., Ltd.; Bromford Tube Co., Ltd.
Street lanterns and globes.—Revo Electric Co., Ltd.
Electric kettles.—Premier Electric Heaters, Ltd.
Potential and current transformers.—Ferranti, Ltd.
Time switches.—Venner Time Switches, Ltd.

Reigate.—Town Council. Accepted :—
Alterations in the public street lighting (£460).—Brighton Lighting and Electrical Co., Ltd.

Shelf.—Urban Council. Accepted:—
Installing electric lighting in Council houses.—G. Jackson.

Spalding.—Urban Council. Accepted:—
Cables :—H.p. overhead section (£640), underground section (£84), l.p. distribution system (£290).—John Collier & Son, Ltd.

Stainland.—Accepted:—
Installing electric lighting at St. Andrew's Church, schools and institute.—Ernest Turner.

Sunderland.—Tramways Committee. Accepted:—
100 tons of tramway rails.—Dorman, Long & Co. (A. McBean & Co.).

Weymouth.—Electricity Committee. Accepted :—
Extension of boiler house at power station (£1,874).—J. A. Parsons & Son.
Mains, switchgear and transformers for supply to rural area (£19,340).—Johnson & Phillips, Ltd.

Winchester.—City Council. Accepted:—House-service electricity meters (prepayment meters excluded) for 12 months.—Chamberlain & Hookham, Ltd.

Woking.—Drainage Committee. Recommended :—Installation of electric motors and stereophagus pumps at pumping station, &c. (£1,400).—Pulsometer Engineering Co., Ltd.

Forthcoming Event.

Association of Mining Electrical Engineers (South Wales Branch).—Saturday, July 31st, at the South Wales Institute of Engineers, Cardiff. Meeting with the Colliery Managers' Association. "Mine Haulage Signalling Systems." Mr. S. W. Richards.

The "Electrical Review" Service Department.

INQUIRIES must be accompanied by a stamped addressed envelope.

We should be glad to learn the names and addresses of makers of the following :—

A tumbler switch marked "K" in a double circle.

DRUM vertical-type vacuum cleaners.

DUTCH BRAND adhesive tape.

An electric tracing wheel as used by dress designers and cloth cutters.

We also require the present address of S. Rogers & Co., fan makers.

A tube-signalling lamp in the form of a pistol, with sighting tube, and provided with red and green screens.

Notes.

The Work of the Post Office.

On July 12th, Sir W. MITCHELL-THOMSON, the Postmaster-General, introduced the Post Office Estimates, and gave a review of the work of his Department. He said that for the year which closed on March 31st, 1928, the surplus on postal services was £8,850,000; the deficit on telegraph services was £1,389,000; and the surplus on telephone services was £120,000. There was, therefore, a total combined surplus on all services of £7,581,000, the largest surplus since commercial accounts began to be kept. Referring to broadcasting, he said that, on the whole, the institution of the British Broadcasting Corporation had justified itself. Broadcasting in this country had been established on a foundation which was the envy of other countries. As regarded general policy, for which he took responsibility, the most important matter was the regional scheme. After considerable experiments at Daventry, the Corporation proposed to embark on a regional scheme of large twin stations. It applied last February for authority to commence by working a two-wave high-power station at Brooklands Park, near Potters Bar, to replace 2LO. He had authorised it to proceed, and it was expected that the station would be completed some time next summer. In the first instance, single-wave working only would be adopted, until it was seen, by further experiments and tests, whether twin-wave transmission was generally practicable. On June 14th the Corporation applied for general permission to proceed with the preliminary steps for twin-wave high-power stations at Manchester, Glasgow, and Cardiff, and for a single-wave high power station at Belfast. That application was now under consideration. He anticipated that he would be in a position to give permission almost at once, and the search for the actual sites would then have to be begun. As regarded Empire broadcasting, he had authorised the Corporation to conduct experiments in short-wave broadcasts to the outlying parts of the British Empire, and those experiments were still in progress. The total number of receiving licences in force on June 30th last was 2,519,072. The number on the corresponding date last year was 2,307,678. The receipts from the licences were divisible in the following proportions: Receipts, £1,253,150; to the B.B.C., £898,804; 12½ per cent. to the Post Office for the cost of collection, £156,644; balance retained by the Exchequer, £197,702.

Last year was a record in telephone development. The increase in the number of telephone stations was the highest figure yet achieved, 122,405, bringing the total number of stations up to 1,631,191. London stood third among the great cities of the world; a long way behind New York, but not so very far behind Chicago. The development of the automatic system continued. There were now 120 automatic exchanges open in different parts of the country. This year he anticipated that new automatic exchanges would be completed and opened at Bath, Colchester, Middlesbrough, and Walsall. There were two automatic exchanges open in London, Holborn and Bishopsgate. Six more would be opened this year—Sloane within a few weeks, Western, Monument, Bermondsey, Maida Vale and Edgware. In 1929-30 there were 12 others which would be converted. As regarded rural telephone development, he was well satisfied with the figures for the last three years. They were developing faster than ever before, and at a rate which compared satisfactorily with rural development in any other country. Orders had been placed for a number of small automatic exchanges, and if they were successful the maintenance charges would be considerably reduced. That, in turn, would affect the amount of the guarantee. With regard to the inland telegraph service, there was very little change in the general trend of the results.

The Shannon Electricity Scheme.

Delegates to the Congress of the Irish Technical Institution Association at Limerick recently devoted a day to an inspection of the Shannon electricity works, a party of about 180 being conducted over the works by Prof. R. S. Rishworth, the Free State Government engineer in charge of the civil engineering side of the undertaking.

From Killaloe the party was conducted along the new canal which will carry the water from the Shannon at the intake at Parteen to the power station at Ardnacrusha, a distance of seven miles. The visitors were greatly impressed by the machinery in operation on constructional work and by the fact that the hundreds of men employed seemed to be mere attendants on machinery. It was ascertained that since operations began about 70 young engineers from the colleges in Dublin, Cork, and Galway had been employed, and that so valuable was the experience gained, that some of them had been offered and had accepted valuable posts in the Colonies.

Following the visit, Dr. McLaughlin, managing director of the Free State Electricity Supply Board, addressed the Congress, and explained how the Shannon scheme in actual operation would work and what it would mean to the people of the country in their daily lives. When the intending consumer could not afford to wire his premises, the Electricity Board would wire them for him on a long-term repayment basis. There would be no reason whatever why every business premises and every house in the Free State should not have the full advantage of electricity supply.

Major Stanley, Director of Technical Education, Belfast, who said that he had been an engineer for many years, gave some information acquired by him as Chairman of the Commission of Inquiry into the power resources of Northern Ireland. The advantages of a large electrical power scheme were quite obvious for a country with a large number of small and scattered industries requiring power. Many people were inclined to be too optimistic about the results of cheap electrical power in the matter of doing away with unemployment and trade depression. The present position of the industrial north-east coast of England proved that such a belief was not justified. It was also a fallacy that electricity produced by water power would necessarily be cheap. The cost of the coal used in the Belfast electricity plant was less than one-sixth of a penny per unit; and even if the coal were got for nothing, the reduction of the cost to the consumer would be only a small fraction of a penny.

The Commission found that the main items in the cost of electricity were the capital charges and the expenses of distribution. They could get cheaper electricity only by keeping down the capital charges, and by increasing the load factor to at least 50 per cent.

He calculated that, with the full output of the partial development scheme, the charge would have to be something like £3 per kilowatt, as compared with £2 12s. 6d. in Belfast. He was afraid that the country was going to be disappointed if that was the way the Shannon scheme was going to be run.

Dr. McLaughlin, in the course of his reply, said that the supply of electricity to a certain class of consumer in Belfast was not comparable with the conception of the Shannon scheme. The fundamental idea behind the scheme was to generate electricity from home sources, carry it to the towns and villages, and sell it there cheaper than any other form of energy. He believed that from the Shannon new industries would grow in the country towns. They had no doubt that they would be able to supply electricity in Dublin much more cheaply than it was being generated there.

Electricity Charges in Wandsworth.

It will be remembered that the inquiry held by the Ministry of Transport in May last into the maximum price which the County of London Electric Supply Co., Ltd., was empowered to charge for electricity supplies in Wandsworth was adjourned, in order that a conference might take place between the company and the Wandsworth Borough Council as representing the consumers. The conference duly took place at the Company's offices in London on Friday, July 13th, when, in the unavoidable absence of Sir Harry Renwick owing to ill-health, the visitors were received by two of the directors, Sir Frederick Hall, M.P., and Lord Gainford. The deputation, which was

introduced by the Mayor of Wandsworth, Alderman J. Plumridge, included several aldermen and councillors and three representatives of the six ratepayers' associations and chambers of commerce in the borough.

A long statement of the directors' proposals to meet the demand for lower charges was made by Mr. J. C. Dalton, the secretary of the County Co. After long investigation it had, he stated, been decided to offer private consumers a multi-part tariff based on the approximate floor area of a house. The exact details for different sizes of house had not been worked out, but as an example Mr. Dalton cited a house containing 1,200 sq. ft., which would be subject to a quarterly charge, including meter rent, of 15s. per quarter, plus a charge of 1d. per unit for energy used for lighting, heating, or power purposes. Consumers would have the option of paying on the present basis, the charge, however, remaining at 6d. per unit for lighting purposes. For shopkeepers it was proposed to reduce the charge for after-shop-hour and week-end lighting to 1½d. per unit.

The proposals gave rise to a very lively discussion, both the representatives of the Council and of the Consumers' Committee forcibly expressing the view that they were entirely inadequate. They stated that they had come with the expectation that the Company fully intended to bring itself into line with power distributors in other parts of the metropolis, whereas, as a matter of fact, it was offering little or nothing. It remained, said some of the speakers, to be seen whether the multi-part tariff showed any advantage to the private consumer, one councillor going so far as to assert that the advantage would be but a slight one, for in view of the fact that the alternative was 6d. per unit, it was clear to him that the multi-part tariff had been worked out on a basis that would give the Company the equivalent of 6d. per unit. Strong objection was also taken to the poor offer in respect of shop lighting, the high charge for supply in respect of which was acting as a deterrent to trade development in the borough. What was wanted was a reduction of the price of energy for private and shop lighting to 4d. per unit, with a proportional reduction in the prices for supplies for other uses. It was pointed out that the Council and consumers had still another opportunity of placing their case before the Commissioners appointed by the Minister of Transport, and it was strongly urged that the Company should consider the question of a further price reduction before the adjourned inquiry took place.

Sir Frederick Hall, on behalf of the Company, promised that the points raised should have serious consideration immediately the chairman, Sir Harry Renwick, was able to return to business.

Municipal Tramways Association of Great Britain and Ireland.

The annual three days' conference of the Association will be held at Manchester, commencing on Wednesday, September 12th. Ald. James Bowes, chairman of the Manchester Tramways Committee, will be the president of the conference.

Loughborough College Scholarships.

The college governors invite applications for the award of five open scholarships in the Faculty of Engineering, each of the value of £75 per annum, open to British subjects situate in any part of the Empire, and tenable at Loughborough College, Leicestershire, England, for the period of the full diploma course. The entrance examination for the 1929-30 session will take place on April 16th, 17th and 18th, 1929; applicants must be not less than 16 years of age, and further particulars and application forms may be obtained from the College Registrar, to whom all forms of application must be returned not later than March 28th, 1929.

Extensible Cables Under Test.

Reference has already been made in these columns to the extensible cables which are being manufactured by the Land und See Kabelwerke Gesellschaft, of Nippes, Cologne. In order to demonstrate the efficiency of the cables a series of tests was recently carried out at the works in the presence of a number of German and foreign electrical engineers. The trials were conducted on a 32-ft. length of 3-core, 70-sq. mm., 10,000-V cable, which, in order to demonstrate the effect of extension and compression on the connecting sleeve, was cut in the centre and then connected up by one of the company's sleeve connections. The cable was subjected to a 6-hour tension test, at the end of which it was found that it had lengthened to the extent of 12 centimetres or approximately 1.4 per cent., no modification of the composition of the cable either in the copper, the lead, the paper insulation, or the sheathing being visible. The cable was then submitted to the standard test of 21,000 V, and finally to a breakdown test of 80,000 V, both of which tests it successfully withstood.

Ampère's House.

The house at Poleymieux, near Lyons, France, in which Ampère spent his childhood and boyhood, has recently been acquired by the Société Française des Electriciens, which will maintain it as one of the historical buildings of France.

Train Collision Inquiry.

The Ministry of Transport held an inquiry at London Bridge Station on July 13th into the collision which occurred between an electric train and a light engine on July 9th. Evidence was given that the accident was not due to any mistake by a signalman. The fireman of the light engine admitted not seeing a ground signal near the signal-box, and the driver said he had no view of the electric train as it crossed his path. He applied the brakes, but he was too late.

E.A.W. Activities.

The last of the London E.A.W. fixtures for the summer session took place on July 10th. A party of nearly forty members visited the Ashtead Potteries, where Major Moore gave an outline of the various processes in the manufacture of pottery before the party was conducted round the works. It was most interesting to note the adaptations of electricity to one of the oldest industries in the world. A visit was also paid to the Frederick Milner Home at Leatherhead, where ex-Service men were engaged in electrical work, chiefly making "Thermega" electric blankets. Electric sewing machines were used. The party were afterwards entertained at tea by Mrs. M. B. Jackson, a Founder Member of the E.A.W.

At the invitation of Mrs. de Ferranti, members of the Manchester branch visited Deganwy last week with the object of inspecting her all-electric seaside house, "Little Haldon," after being entertained at luncheon at the Castle Hotel. The house has practically been remodelled, all fireplaces having been removed, and electric radiators only are now used for heating. All lighting, cooking, heating of water, and washing is done by electricity. An admirably produced booklet describing, with illustrations, the house and its equipment, has been prepared. The E.A.W. is now forming a North Wales branch, and hopes to hold its inaugural meeting at the end of September.

An Engineering Congress in Japan.

The programme of the World Engineering Congress which is to be held in Tokio, Japan, in October next, has now been issued. The work of the Congress will be divided into 23 sections, Japanese and English being the official languages. Full particulars can be obtained from the Secretary of the World Engineering Congress, Nihon Kogyo Club, Marunouchi, Tokio.

Television.

An official announcement by the British Broadcasting Corporation draws attention to the fact that various statements have been published in connection with the development of television and rumours that are current of the part which the B.B.C. is likely to play in connection therewith. In order that its listeners may not suffer disappointment by anticipating the possibility of seeing as well as hearing its performances, the B.B.C. wishes to make it plain that it has not so far been approached with apparatus of so practical a nature as, in the opinion of the Corporation, to make television possible on a service basis. It should be noted that the Postmaster-General, in replying to questions in the House of Commons, has indicated that in the opinion of his officers television is still in the experimental stage and that the time has not yet come to make arrangements for the provision of a public service. When the development of the science has reached such a stage that some form of service which will benefit listeners may be guaranteed, the B.B.C. will be prepared, subject to the approval of the Postmaster-General, to co-operate in the matter.

At the Bell telephone laboratories in New York, on July 12th, the results of another year's research were demonstrated in the presence of Press representatives. The most important innovation was an improved transmitter, installed in the roof of the laboratories, which is reported to have sent a picture of a man swinging a tennis racket and bouncing a ball, to the receiver in a room on the eighth floor. The earlier apparatus could transmit only a person's head and shoulders and the scene had to be illuminated by a rapidly oscillating beam from a powerful arc light, which kept within narrow limits the area of the scene transmitted; but the present improvement makes possible the illumination of the scene by natural sunlight, thereby freeing television from one of its most serious handicaps.

The Batti-Wallahs' Society.

On July 11th, Major-General Sir Philip Nash, G.C.M.G., C.B., chairman of the Metropolitan-Vickers Electrical Co., Ltd., was the principal guest at a well-attended luncheon of the Batti-Wallahs' Society at the Hotel Cecil. The President, Mr. R. W. Hughman, occupied the chair, and made the shortest speeches on record.

In the course of a brief address, Sir Philip Nash said that the electrical manufacturers relied upon the supply side of the industry to stimulate the demand for electricity and to keep them busy. British manufacturers were in the front rank of the world's producers, and, thanks to their exporting business, which amounted to 50 per cent. of their normal output, and was of vital importance to the industry, they were in a position to cope with the new requirements for large machines at home. To-day this country was the largest exporter of electrical apparatus in the world, but it would not be easy to retain that position.

He thought that the national effort to raise the consumption of electricity to 500 kWh per head per annum underestimated the possibilities, but, from the first, three schemes of the Central Electricity Board, which "selected" 48 stations, he inferred that eventually there would be 100 selected stations; that was far too many. The Board dealt only with generation and transmission, but not with distribution, which would

become more and more important; they could not treble the output of energy unless their selling methods were radically changed. A commercial organisation must be set up, to sell electricity and to educate the public, if the big load was to be attained.

The profits made by the manufacturers were totally inadequate to keep the business going; a large volume of trade was essential. Our foreign competitors had some advantages: if they took 100 to represent the cost of labour and taxation in this country, the corresponding figures were for Switzerland 93, France 95, Germany 89, and Belgium 58—but the British manufacturers could contend successfully against this handicap if (and only if) they got a large volume of home business. All should work together to improve methods and organisation, to increase efficiency and effect economy by regrouping the manufacturing units, to help research, and to raise the scientific level of the employés.

Mr. Henley Howard, in moving a vote of thanks to the speaker, expressed the view that the consumption would be much more than 500 kWh per head in ten years' time.

An Electrical Trade Golfing Society.

A correspondent holds the view that the electrical trade compares unfavourably with other trades in respect of social and sporting meetings, and suggests that an "Electrical Trade Golfing Society" be formed. He is prepared to take action himself with a view to doing this, if a sufficient number of our readers support his proposal, which appears to be a "happy thought." We shall be pleased to hear from them.

A Conference on Road Signs and Traffic.

At a conference held by the Association of Public Lighting Engineers in February last it was resolved: "That a conference be called by the British Engineering Standards Association, representative of all interested bodies, to consider the question of setting up a Committee for the Standardisation of Road Signs and Signals." Capt. W. J. Liberty, secretary A.P.L.E., informs us that the Conference asked for in this resolution will be held on Tuesday, July 24th, at 2.30 p.m., at the Institution of Mechanical Engineers, Storey's Gate, London, so that if desired, a Committee may be formed to deal with this subject. Communications should be addressed to Mr. P. Good, Illumination Section, British Engineering Standards Association, 28, Victoria Street, Westminster, London, S.W.1.

Standard Specification for Drills.

A Standard Specification for Twist and Straight Flute Drills, No. 328—1928, has been issued by the British Engineering Standards Association. It contains tables of the standard diameters, overall lengths, and flute lengths for various types of drill, and the dimensions of the Morse taper shanks. Standard limits are laid down for the permissible variation in the diameter of the drills and performance tests are specified for both carbon and high-speed drills from No. 60 to 2 in. diameter, inclusive. Standard nomenclature and definitions for different types of drill in common use are also included in the specification, copies of which may be obtained from the Publications Department of the British Engineering Standards Association, 28, Victoria Street, Westminster, London, S.W.1, price 2s. 2d. post free.

Standard Specification for Traction Motors.

The revision of the old British Standard Specification No. 72 for Electrical Machinery was completed some months ago by the issue of the B.S. specification for Rotary Convertors No. 172-1927, and the British Standard Rules for Methods of Declaring Efficiency No. 269-1927, there now being a series of seven specifications, which, taken together, replace the old specification No. 72. Some of the newer specifications have already reached the revision stage, the latest to be revised being that for the Electrical Performance of D.C. Series-Wound Traction Motors No. 173-1928, in which the latest recommendations of the International Electrotechnical Commission have been adopted in so far as they are applicable to service conditions in this country. The tests to be applied to traction motors are dealt with in greater detail than in the old specification, particularly as regards commutation tests. An important change in the new specification relates to the method of determining the temperature rise, the resistance method being specified for use wherever possible. In the old specification the thermometer method was the only method recognised. Copies of the new specification (No. 173-1928) may be obtained from the Publications Department of the B.E.S.A., 28, Victoria Street, London, S.W.1, price 2s. 2d., post free.

Electricity Regulations in the Belgian Congo.

The Colonial Government of the Belgian Congo has recently approved a decree setting up Regulations regarding the supply of electricity in the Colony. They stipulate (1) that for private lighting installations only 110-V d.c. or a.c. shall be used; (2) for public lighting or for both public and private power distribution systems, only three-phase four-wire current at 220/390 volts is permitted; (3) for power reserved for traction or private or public power purposes, d.c. or three-phase at 550 V may be used; and (4) power may be distributed in bulk as a.c. at 2,200, 6,600, 10,000, 15,000, 55,000, or 110,000 V. In the case of alternating current a frequency of 50 periods per second is to be standardised.

Industrial Welfare.

The provisional programme of a lecture conference to take place at Balliol College, Oxford, on September 7th-11th, 1928, has been received from the Industrial Welfare Society. The opening address will be given by Dr. James Baillie, O.B.E., Vice-Chancellor of Leeds University. Amongst other items will be a lecture by Mrs. Willson, M.B.E., president, Women's Engineering Society, on "A Comparison of Working Conditions in the Nineteenth and Twentieth Centuries," and a lecture by Miss C. Haslett, director, Electrical Association for Women, on "Incentives in Industry."

Appointments Vacant.

Assistant lecturer in electrical engineering (£300) for Birmingham University. Borough electrical engineer (£400) for the Bury St. Edmunds Corporation. Transformer engineer for the General Electric Co., Ltd. Deputy mains engineer for the Borough of St. Helens Electricity Department. Tramways and transport general manager and engineer for the City of Leeds tramway undertaking. (See our advertisement pages to-day.)

Fatalities.

While at a swimming bath at Coventry on July 10th, Stanley Jones, aged 14, caught hold of a "live" electric wire and received a fatal electric shock of 250 V. At the inquest on July 12th it was stated that the wire was hanging from a fuse box, 6 ft. from the ground. The jury, in returning a verdict that death was due to shock received from a defective fitting, expressed the opinion that fittings of a temporary character should be removed at the earliest opportunity, and should be strictly under the supervision of duly qualified Corporation officials.

Mrs. Williman, of Hilldown Road, Streatham, was found dead in a room of her house on July 11th with her hand grasping the top of an electric vacuum cleaner, and a small gas stove lying across her body. At the inquiest, held at Camberwell on July 13th, Mr. H. Williman, her husband, stated that his wife bought a "Thor" vacuum cleaner from the County of London Electric Supply Co., Ltd. It had been used about 20 times, and he had used the cleaner himself and never had any trouble with it. Dr. Lucas, a pathologist at King's College Hospital, said that Mrs. Williman died from paralysis of the heart caused by a long-continued electric shock. Mr. C. A. Baker, senior electrical inspector of the L.C.C., stated that the top of the handle of the cleaner was metal covered, and contained the switch which started and stopped the motor after the flexible cord had been plugged in. He expressed the opinion that the handle of the cleaner should not be in the electric circuit, and should be entirely insulated. The switch of this particular machine was defective, and anyone holding the handle in one hand and touching a gas stove with the other would receive the full pressure of the electricity supply. Mr. F. M. Iredale, representing the makers of the vacuum cleaner, said that a new design of handle made of ebonite was now in use on their machines. The jury returned a verdict of "Accidental death," caused by a defective switch in a vacuum cleaner, and added a recommendation that vacuum cleaners should not be supplied to the public unless the handles were properly insulated with non-conducting material.

Educational.

UNIVERSITY COLLEGE OF SWANSEA: ALLIED SCIENCE DEPARTMENTS. SESSION 1928-29.—Particulars of the courses in civil, mechanical and electrical engineering, and metallurgy, and of the entrance scholarships, can be obtained from Mr. E. Drew, Registrar.

Institution Notes.

Institution of Electrical Engineers.

COUNCIL FOR 1928-29.—The scrutineers in the recent ballot for new members of Council have reported that 1,249 ballot papers were returned, of which nine were spoiled, and that the result of the ballot is as follows:—

President.—Lt.-Col. K. Edgcumbe, R.E. (T.A.).

Vice-Presidents.—Mr. P. V. Hunter, C.B.E., Mr. H. A. H. Railing, D.Eng.

Hon Treasurer.—Lt.-Col. F. A. Cortez Leigh, T.D., R.E.T. (Ret.).

Ordinary Members of Council.—(Members): Messrs. J. M. Kennedy, R. K. Morcom, C.B.E., C. C. Paterson, O.B.E., F. W. Purse, E. H. Shaughnessy, O.B.E., and Lt.-Col. W. A. Vignoles, D.S.O. (Associate members): Messrs. T. G. N. Haldane, M.A., and S. Harcombe, M.A., B.Sc. (Associate): Sir Philip A. M. Nash, K.C.M.G., C.B.

A.M.I.E.E. EXAMINATION.—The next examination will be held on November 28th, 29th, and 30th, 1928. Entry forms for the examination, which must be completed and returned by October 1st, and particulars regarding election to membership of the Institution may be had on application to the secretary.

Our Personal Column.

Electrical men are invited to enable us to keep readers of the "Electrical Review" posted concerning their movements.

Mr. C. E. KNOWLES, J.P., who has retired after 27 years' service from the position of resident engineer and manager at Glossop to the Urban Electric Supply Co., Ltd., has been presented by the staff with an inscribed Jacobean oak electric standard. He is succeeded by Mr. T. L. PODMORE.

The Bromley (Kent) Town Council has settled the salary of the electrical engineer at £750 per annum, rising by £25 a year to £1,000.

The Tunbridge Wells Town Council, on July 4th, granted a request from the borough electrical engineer, Mr. R. N. TORPY, to be paid in accordance with the national scale of salaries for chief electrical engineers.

Mr. STANLEY ABSON has been appointed secretary to the Stockport Corporation Electricity Committee, and will be directly responsible for all matters arising on the commercial side of the undertaking.

The Canterbury City Council has adopted a sliding scale for the salary of its electrical engineer (Mr. C. A. BLASCHECK) based on the annual sales of energy. The scale commences at £800 for two million kWh, and rises to £1,055 for ten millions.

Mr. H. H. SUTCLIFFE, electrical engineer and manager to the Hebden Bridge Urban District Council, has just completed 21 years' service in the undertaking of which he is now the head and in which he started as an apprentice.

The Hackney Establishment Committee has made recommendations regarding the remuneration of the borough electrical engineer, following upon an observation by the District Auditor. At present Hackney has its own scale, which rises in accordance with the number of kWh sold. It is recommended that in lieu of this the A.M.E.E. scale shall be employed, plus 10 per cent. On last year's sales (34 million kWh) Mr. ROBINSON'S remuneration is about £1,800 under the Hackney scale, whereas under the A.M.E.E. scale (plus 10 per cent.) it would be £1,738. The salary would continue to be lower than under the Hackney scale until the sales rose to 55 million kWh; from that stage onward the change would be in the electrical engineer's favour. The Committee says: "It is anticipated that the number of units to be sold will increase rapidly in the near future."

Glasgow Corporation Special Committee on the Reorganisation of the Electricity Department at a meeting last week recommended that the new manager, Mr. HERBERT BELL, Hull, although he is over age for participation in the Corporation's superannuation scheme, be accorded by the Department the same benefits as he would receive if he came under that scheme. It was explained that Mr. Bell was willing to transfer to Glasgow Corporation his deposit in the Hull scheme if he were put on the superannuation basis.

At the recent first meeting of the newly-elected West Midlands District Industrial Council for the Electricity Supply Industry, Mr. R. F. DEMPSTER, Amalgamated Engineering Union, was elected chairman, and Mr. G. R. J. PARKINSON, Midland Electric Corporation for Power Distribution, was elected vice-chairman.

Mr. ALAN WILLIAMS, M.I.E.E., has been appointed representative in Great Britain for Messrs. Moffats, Ltd., of Weston, Ontario, Canada, for the sale of their "Gold Medal" electric ranges. Until proper office accommodation has been secured Mr. Williams asks all those interested to communicate with him at his home address, 16, Messaline Avenue, Acton, W.3.

Mr. G. E. DRAYCOTT, Head of the Engineering and Building Trades Department of the Borough Polytechnic, S.E.1, is retiring at the close of the current session after 31 years in South London. The Governors have appointed Mr. F. H. REID, B.Sc., M.I.Mech.E., formerly of Northampton Polytechnic and now Head of the Engineering Department, Sunderland Technical College, to succeed Mr. Draycott.

At its meeting last week the Cardiff Electricity Committee considered an application from the electrical engineer (Mr. A. MORLEY NEW) for an increase in his salary, at present £1,250. Mr. New pointed to the expansion of the undertaking and the savings effected in generating costs, and suggested that his salary should be based upon output. A member objected to that, as it would, he said, raise Mr. New's salary above £2,000 a year. Another member moved that the engineer's salary should be increased to £1,500, but this was not seconded. Another proposal that an immediate increase of £100 should be granted, with two further annual increments of £50, also failed to find a seconder. Finally the Committee adopted a resolution to the effect that it could not see its way clear to grant an increase to Mr. New "because the time is inopportune and the circumstances of the moment do not warrant this or any other committee increasing the salary of any official receiving more than £100 a month."

The Stoke Newington Electricity Committee recommends that Mr. W. FORSTER, district mains engineer with the Hackney Borough Council, be appointed deputy borough electrical engineer. There were 67 applications for the position and six candidates were interviewed.

Obituary.—MR. S. E. DAY.—We regret to learn that Mr. Sidney Edmund Day, borough electrical engineer of Bury St. Edmunds, passed away on Saturday last after nine weeks' illness. Mr. Day was 45 years of age, and his connection with the Bury St. Edmunds undertaking dated from 1900, when he entered as an apprentice under the late Mr. Rowe. He became assistant engineer, and just before the war became borough electrical engineer in succession to Mr. Griggs. Under his control the undertaking was considerably extended. Mr. Day took an active part in local affairs, and was a member of the operatic and choral societies. The funeral took place at St. Mary's Church, Bury St. Edmunds, on Tuesday last.

Financial Section.

New Companies, Returns of Share Capital, Debenture Changes, Reports of Electrical Companies, Dividend Results, Transactions in Stocks and Shares.

New Companies Registered.

European Hydro-Electric Co., Ltd.—Registered as a public company July 7th. Capital, £35,000 in 25,000 10 per cent. cumulative participating preference shares of £1 each and 200,000 ordinary shares of 1s. each. Objects: To carry on the business of a hydro-electric, public utility, electric light, heat and power company in all its branches, to construct, lay down, and establish cables, wires, lines, accumulators, lamps and works, to adopt an agreement with Ignatius Sillitti and Alexander H. Maclean, &c. The first directors are:—M. Campbell-Johnston, 21, Oxford and Cambridge Mansions, Marylebone Road, N.W.1, barrister; E. Sarton White, B.Sc., 4, Eslington Terrace, Newcastle-on-Tyne; H. Everill, 30, Arundel Road, Eastbourne, retired bank manager; A. H. Maclean, 5, Portland Place, W.1, director, Colonial Enterprises, Ltd. Registered office: 199, Winchester House, E.C.2.

Consolidated Electrical Supplies, Ltd.—Registered as a private company, July 11th. Capital: £100,000 in £1 shares. Objects: To carry on the business of manufacturers, importers, and exporters of and dealers in all kinds of electrical and mechanical machinery, plant and apparatus, wireless apparatus, valves and fittings, cables and wires of all kinds, whether for electrical, telegraphic, telephonic, or any other purpose, &c. The subscribers (each with one share) are: F. Clements, Kildare, Rectory Road, Rickmansworth, Herts., secretary of public companies; C. Collins, "Orchardcombe," Orchard Road, Bromley, Kent, accountant; G. G. Macdonald, "Pas Demi," Chorley Wood, Herts., patent agents' chief clerk. The first directors are to be appointed by the subscribers. Solicitor: A. R. Monks, Crown House, Aldwych, W.C.

Associated Electrical Industries, Ltd.—Registered as a public company, July 7th. Capital, £100,000 in £1 shares (50,000 7 per cent. cumulative preference with priority as to capital and 50,000 ordinary). Objects: To acquire and hold shares, debentures and securities of any British or foreign company, and to carry on the business of underwriters, pro-

motors, manufacturers of and dealers in electrical machinery, plant and apparatus, lamps and fittings, wireless apparatus, valves and fittings, cables and wires of all kinds, whether for electrical, telegraphic, telephonic, or other purposes, &c. The subscribers (each with one share) are: C. Collins, "Orchardcombe," Orchard Road, Bromley, Kent, accountant; D. Q. Holland, 87, Glenister Park Road, Streatham, S.W.16, registrar to public companies; V. J. Radbone, 268, St. James's Court, S.W.1, electrical engineer, and four others. The first directors are to be appointed by the subscribers. Solicitor: A. R. Monks, Crown House, Aldwych, W.C.2.

Bovis (1928), Ltd.—Registered as a public company July 11th. Capital, £300,000 in 125,000 7½ per cent. cumulative preference shares of £1 (with priority as to capital) and 3,500,000 ordinary shares of 1s. each. Objects: To adopt agreements (1) with Bovis, Ltd., and G. Mott, the liquidator, (2) with S. Gluckstein, S. Joseph and V. Gluckstein, and (3) with John Prust & Co., and to carry on the business of builders, general contractors, decorators, painters, electrical, constructional, and general engineers, boiler makers, machinists, wood workers, &c. The directors (to number not fewer than three or more than nine) are: Viscount Bury, M.C., J.P., 24, Princes Gardens, S.W.; Sidney Gluckstein, 29, Elsworthy Road, N.W.; S. Joseph, 2, Connaught Place, W.; and Vincent Gluckstein, 26, Weymouth Street, W., directors of Bovis, Ltd.; Wm. C. Idle, "Sandford," Harrow View, Harrow, building surveyor; Geo. Mott, 122, Woodcote Grove Road, Coulsdon, Surrey. The first four named are "ordinary" directors and the two last named are "employé" directors. Registered office: 41-4, Upper Berkeley Street, W.1.

West Yorkshire Electric Co., Ltd.—Private company. Registered July 11th. Capital, £500 in £1 shares. Objects: To carry on the business of manufacturers of and dealers in electric globes, lamps, shades, fittings, fixtures and accessories, and all classes of wireless goods, &c. The subscribers (each with one share) are: Margaret B. Ritchie, and Mary H. Ritchie, 54, Rosebank Lane, Woodsley Road, Leeds. The first directors are to be appointed by the subscribers. Secretary: M. B. Ritchie. Registered office: 54, Rosebank Lane, Woodsley Road, Leeds.

Gambrell Radio, Ltd.—Private company. Registered July 11th. Capital, £500 in £1 shares. Objects: To acquire the business of sellers, importers and exporters of and dealers in radio apparatus and parts now carried on by Gambrell Bros., Ltd., at 76, Victoria Street, S.W.1. The directors are: T. E. Gambrell, Crowthorne, Westerham, Upper Warlingham, Surrey; C. T. Gambrell, Crowsnest, Valley Road, Kenley; A. Onwood, 23, Hambledon Road, Southfields, S.W.; R. Annan, 52, Westfield Road, Surbiton; Capt. W. B. Goodwin, M.C., 78, Adelaide Road, Hampstead, N.W. Secretary: H. T. Gambrell.

"K. N." Electrical Products, Ltd.—Private company. Registered July 6th. Capital, £6,000 in £1 shares. Objects: —To adopt an agreement with I. Knowles and F. Knowles and to develop and turn to account the business of manufacturers of, and dealers in, electrical goods and appliances formerly carried on by them, including the registered design 732,557, and the benefit of all pending applications by them for patents in respect of electric soldering irons, to carry on the business of manufacturers of, and dealers in, radio sets and components, gramophones, &c. The subscribers (each with one share) are:—T. I. Casswell and S. A. Jarrett, Fitzalan House, Arundel Street, Strand, W.C.2, articled clerks. The first directors are I. Knowles (chairman) and D. N. Smith (managing director). These directors are permanent. Solicitors: Horner & Horner, Fitzalan House, Arundel Street, Strand, W.C.2.

Northern Electric Supplies Co., Ltd.—Private company. Registered July 10th. Capital, £500 in £1 shares. Objects: To carry on the business of manufacturers of, agents for, and wholesale and retail dealers in electrical wires, cables, lamps, fittings, apparatus, appliances and accessories, including radio apparatus, heating, cooking and power apparatus, motor cars, &c. The subscribers (each with one share) are:—W. F. Griffiths, 5, Guildhall Street, Lincoln, electrical engineer; J. McVay, 8, East Parade, Leeds, associated accountant; W. F. Griffiths is permanent managing director.

Henshall Bros., Ltd.—Private company. Registered July 5th. Capital, £1,500 in £1 shares. Objects: To acquire the business of a dealer in wireless and electrical sundries and musical instruments carried on by R. Henshall at 89, Lower Hillgate, Stockport, as "Henshall Bros." The first directors are:—W. D. Henshall and F. Henshall, 17, Sandhurst Road, Mile End, Stockport, and R. Henshall, 503, Dialstone Lane, Stockport, wireless dealers. Secretary: F. Henshall.

A. Smethurst, Ltd.—Private company. Registered June 30th. Capital, £100 in £1 shares. Objects: To carry on the business of electrical and mechanical engineeers and contractors, manufacturers of agricultural implements and other machinery, &c. The directors are: N. A. Rogers, 102, Hill Lane, Southampton, clerk; J. E. Turnbull, The Burrow, Dibden Purlieu, Hants., clerk. Secretary: L. W. Alborghetti. Registered office: St. Michael's Chambers, 126, High Street, Southampton.

F. H. Sowden, Ltd.—Private company. Registered July 13th. Capital, £1,000 in £1 shares. Objects:—To acquire the business of an electrical and mechanical engineer carried on by F. H. Sowden at Silver Cross Works, Alpha Street, Leeds. The first directors are:—F. H. Sowden (permanent) and Mrs. M. Sowden, 12, Alpha Street, Leeds. Solicitor: Wm. Bateson, Leeds.

Official Returns of Electrical Companies.

Vickers, Ltd.—Capital, £26,500,000 in 54,000,000 ordinary shares of 6s. 8d. each, 7,000,000 cumulative preference, and 750,000 5 per cent. preference shares of £1 each, and £750,000 preferred 5 per cent. stock. Return dated April 12th, 1928. 12,315,483 ordinary, 6,863,807 cumulative preference, and 750,000 5 per cent. preference shares and £750,000 preferred stock taken up. £4,520,673 6s. 8d. paid (being 6s. 8d. on 6,544,621 ordinary and £1 on 2,284,133 preference shares, and £55,000 on the preferred stock), £7,948,294 13s. 4d. considered as paid on the remainder. Mortgages and charges: £1,250,000 5 per cent. 1st mortgage debenture stock, £2,000,000 5½ per cent. 1st mortgage debenture stock, and £56,903 2s. on houses and land at Barrow.

Hastings and District Electric Tramways Co., Ltd.—Particulars filed of a series of notes, to secure £130,000, with premium of 15 per cent. authorised by resolutions of February 29th, 1928, and covered by trust deed dated June 15th 1928. Property charged: £260,000 debenture stock of the company, secured by trust deed dated January 20th, 1905, and supplemental trust deed dated March 20th, 1928. The whole amount is now issued. Trustees: General Investors and Trustees, Ltd., 16, Gracechurch Street, E.C.3.

Welwyn Garden City Electricity Supply Co., Ltd.—Debenture dated June 14th, 1928, to secure £20,000, charged on the company's undertaking and property, present and future, except uncalled capital (ranking *pari passu* with debenture dated September 29th, 1924). Holders: Midland Bank, Ltd.

Radio Service (London), Ltd.—Satisfaction to the extent of £125 on June 15th, 1928, of debenture dated July 25th, 1927, securing £2,750.

Melton Mowbray Electric Light Co., Ltd.—Capital, £60,000 in £5 shares. Return dated May 4th, 1928. 9,600 shares taken up. £48,000 paid. Mortgages and charges, £19,100.

Newmarket Electric Light Co., Ltd.—Capital, £30,000 in £10 shares. Return dated April 30th, 1928. 2,656 shares taken up. £26,560 paid. Mortgages and charges, £14,200.

G. W., Ltd.—Capital, £5,000 in £1 shares. Return dated December 31st, 1927 (filed March 20th, 1928). 102 shares taken up. £102 paid. Mortgages and charges, nil.

Sea Houses and District Electric Supply Co., Ltd.—Capital, £5,000 in £1 shares. Return dated May 31st, 1928. 2,910 shares taken up. £2,910 paid. Mortgages and charges, £328 15s. 1d.

A. Hirst & Son, Ltd.—Capital, £20,000 in 100 preference and 1,900 ordinary shares of £10 each. Return dated May 24th, 1928. 100 preference and 1,220 ordinary shares taken up. £2,200 paid on 100 preference and 120 ordinary shares. £11,000 considered as paid on 1,100 ordinary shares. Mortgages and charges, nil.

John Richards & Co. (Electrical Engineers), Ltd.—Capital, £6,000 in £1 shares. Return dated May 25th, 1928. 4,802 shares taken up. £2 paid. £4,800 considered as paid. Mortgages and charges, nil.

Willans & Robinson, Ltd.—Capital, £173,165 5s. in £30,000 "A" preference stock, £141,655 5s. "B" preference stock, and 30,000 ordinary shares of 1s. each. Return dated May 9th, 1928. All shares and stock taken up. £142,431 10s. paid, £39,733 15s. considered as paid. Mortgages and charges, £128,182.

Dartmoor Electric Supply Co., Ltd.—T. W. W. Melhuish, of 21, St. Leonards Road, Exeter, was appointed receiver on June 28th, 1928, under powers contained in second debentures dated September 19th, 1919.

E.S. Co., Ltd.—B. A. Smith, LL.D., 11, Queen Victoria Street, E.C.4, ceased to act as receiver or manager on June 25th, 1928.

Minehead Electric Supply Co., Ltd.—Capital, £35,000 in 15,000 1st preference, 8,000 2nd preference, and 12,000 ordinary shares of £1 each. Return dated May 12th, 1928. 12,600 1st preference, 5,690 2nd preference, and 5,920 ordinary shares taken up. £24,210 paid. Mortgages and charges: £20,169.

Anglo-American Telegraph Co., Ltd.—Capital stock, £7,000,000 in £284,020 ordinary stock, £3,357,990 preferred ordinary stock, and £3,357,990 deferred ordinary stock. Return dated May 22nd, 1928. All stock taken up. £600,000 paid, £6,400,000 considered as paid. Mortgages and charges, nil.

City Notes.

W. T. Henley's Telegraph Works Co., Ltd.

The annual meeting was held on July 13th, Sir George Sutton, Bt. (chairman) presiding. In moving the adoption of the report (ELEC. REV., July 6th, p. 29), the chairman said that the shareholders had a prosperous business which year by year grew more prosperous, and perhaps the one anxiety of the chairman at these meetings was the possibility that shareholders might desire a larger distribution than the board had considered advisable. There really had never been cause for such anxiety, as the shareholders had always been satisfied with the judgment of the board. Proceeding to refer to the balance sheet, Sir George said that if the directors' recommendations were agreed to, the general reserve would have reached half the amount of the issued share capital. The investments had increased by £50,000 of Treasury bonds, about £4,000 of their own debenture stock had been acquired, and £15,000 had been added to their general investments in electrical undertakings with which the company did business. Stocks were up by £40,000, the debtors were £40,000 down, and the large sum of £126,416 had been expended on capital account. That expenditure represented the economising and increasing of production, with the exception of £2,585, which had been expended on the new sports ground which they were making at Gravesend. An item which did not appear in the balance sheet was the amount standing to the credit of the pension and benevolent funds, the total of which was now £262,000. There was a balance of £532,930 to carry forward, against £506,202 brought in. The primary cause of the satisfactory results was the ability, experience and unslackened attention which had been devoted to their business by their staff—from the chiefs of the undertaking to the worker at the machine satisfactory service had been given. Statistics showed him that the output of their factories per hour per head in the cable department had increased by nearly 10 per cent. since 1913, and in one large department the improvement of output per head during those years was as much as 14 per cent. A reason for that satisfactory improvement was that the factories were fully employed; a busy factory always tended to the raising of the output per head of the people employed. Another reason was the expenditure on new machinery and improvements in organisation. The actual increase in the number of people employed at their Gravesend works was between 300 and 400. The home trade gave them their largest increase, but the overseas trade had also increased, not very greatly, yet by a substantial figure, about 10 per cent. over the previous year. He was excluding from the figures the two large contracts for India and Egypt, which were still in course of execution. He was particularly glad to report the increase in the overseas trade. They had very fierce competition to meet, but nevertheless, that trade last year accounted for more than one-third of the total turnover. The new year showed a satisfactory order book, rather larger than they brought in a year ago. The report referred to the improved results obtained by the Henley Tyre and Rubber Co. The products of the factory had reached a high stage of perfection, which was reflected in the greatly increased turnover over previous years. He was optimistic as to the future outlook. They were continuously increasing their facilities for a larger output to meet the demand, which they hoped would increase year by year. The consumption of electricity at home had doubled during the past seven years, and was likely to continue to increase. They had to be ahead of the demand by making provision for increased output, and their cautious financial dispositions enabled them to do so without raising money by a new issue of shares. They had authority for the issue of 150,000 new shares, but he saw no prospect of their having to exercise those powers. Mr. A. E. Salmon seconded the motion, and the report was adopted. Subsequently a resolution was unanimously agreed to increasing the remuneration of the directors from £750 per annum to £1,250, subject to confirmation at the next annual meeting.

Petters, Ltd.

Speaking at the annual meeting on July 11th, Sir Ernest W. Petter (chairman) said that having regard to the prevailing conditions in the engineering industry the result of the year's trading had been satisfactory. The depression in the agricultural industry had adversely affected them, but in spite of that the sales of their engines at home and abroad had been increased. It was their policy to supply a good article at a fair price, and they resolutely refused to throw themselves into the vortex of foolish price-cutting which times like the present invariably produced. There had been a revival in the aircraft branch. They had found it impossible to place the Ipswich business on a profit-earning basis, and they had accordingly decided to close the works at the end of this year. They were making the necessary arrangements to manufacture the larger sizes of Petter engines at Yeovil. They hoped that the proceeds of the sale would enable them to discharge the greater part of their liability to the bank. In reviewing the economic position of the country, Sir Ernest said that there was a need for a definite national industrial policy; the Government had failed to find any effective means of dealing with the unemployment problem, which considerably augmented the already heavy burden of taxation. He considered that one method of relief was the extension of the Safeguarding of Industries Act. They were grateful to the Government for its rating-relief proposals, but they regretted the deferment of that relief until the autumn of next year.

Delhi Electric Supply and Traction Co., Ltd.

In their report for the year ended December 31st last the directors point out that since the close of the year the capital consolidation scheme has been carried out. The lighting and tramway undertakings showed a net revenue of £49,639, which was £100 above the preceding year's figure. After adding sundry income and meeting general expenses and debenture interest, the available balance is £50,583 (against £49,707). From this £15,000 is put to general reserve, £7,000 to depreciation and renewals, £8,000 to taxation reserve, and £1,000 to employés' provident fund (special contribution) and bonuses. A dividend at the rate of 12 per cent. per annum is recommended upon the 150,000 shares, leaving £1,583 to be carried forward. The bulk supply and other agreements with the Government generating station have been executed; this will postpone the installation of further plant in the company's station. The company hopes to put forward reduced charges next autumn which should have the effect of increasing consumption. Meeting: July 25th.

Burndept Wireless, Ltd.

It is proposed to form a new company—Burndept Wireless (1928), Ltd.—to take over the company's business. The holders of the preferred ordinary shares would receive two 5s. ordinary shares in the new company, credited with 1s. 9d. paid; and the holders of the deferred shares would receive one 5s. ordinary share with 1s. 9d. paid for every 20 shares held. It is proposed that creditors for amounts under £10 shall be paid off in cash at the rate of 7s. 6d. in the £, while other creditors receive half of the amount due to them in the form of 6 per cent. ten-year notes. The receiver and manager reports satisfactory progress during the half-year ended March 31st last, and estimates that the scheme proposed will put the new company in possession of adequate working capital and liquid assets. Last year the company's turnover amounted to about £123,000, but the general sales manager considers that the existing plant is capable of an annual output valued at £250,000.

Aron Electricity Meter, Ltd.

The annual meeting was held on July 11th, when Mr. H. Kahn (chairman and managing director), who presided, said that the company had had many difficulties during the past year, and the available profit was considerably reduced. There had been disorganisation and expense in connection with the removal of some of the departments to new premises; the selling price of meters had fallen considerably; and the new schemes had created an element of uncertainty. The Vienna factory had shown an improvement, and that was the case with the London factory during the first quarter of the current year.

The scheme mentioned in our last issue whereby the preference shares are to be exchanged for 6 per cent. debenture stock was approved.

Folkestone Electricity Supply Co., Ltd.

An extraordinary general meeting is to be held to-day (Friday) for the purpose of confirming a resolution, passed on June 25th, increasing the capital to £237,500 by the creation of 37,500 additional shares of £1 each, of which 35,000 are to be ordinary shares and 2,500 employés' co-partnership shares. Two further resolutions will be put forward: the first provides for the capitalisation of £37,500 of the reserve fund, which will be distributed at the rate of 5s. per share (in the form of shares) upon the existing 140,000 ordinary shares and 10,000 employés' co-partnership shares. The new shares will rank for dividend as from July 1st, 1928. The second resolution provides for the establishment of a pension fund for the employés.

Marconi's Wireless Telegraph Co., Ltd.

In a statement issued on Tuesday last the directors stated that it is intended that the proposed merger with the cable companies shall take effect as from April 1st, 1928. They have decided to postpone the annual meeting until the Government's decision upon the report of the Imperial Wireless and Cable Conference is known. In the meantime they have decided to make an interim distribution of 10 per cent. in respect of the past year upon the ordinary shares. The dividend for 1926 was 5 per cent. The profit, it is stated, rose from £198,948 in 1926 to £430,471 last year. It is hoped to declare a final dividend and to hold the annual meeting in the autumn.

County of London Electric Supply Co., Ltd.

An interim dividend of 3 per cent. (actual) has been declared on the ordinary shares.

South London Electric Supply Corporation, Ltd.

The interim ordinary dividend is at the rate of 6 per cent. per annum.

Victoria Falls and Transvaal Power Co., Ltd.

The directors' report for the year ended December 31st last states that at the close of the year the issued share capital was £3,000,000, and the outstanding debentures amounted to £2,012,540. After providing for debenture interest, depreciation, income tax, &c., there was a net profit of £373,445, as compared with £371,344 in 1926. The addition of £133,006 brought forward makes available £456,451. Of this, £80,000 has been transferred to reserve (as before), and the maximum dividend (10 per cent.) has again been declared on the preference shares. The final dividend on the ordinary shares is 12 per cent., making 15 per cent. for the year, as for 1926. A balance of £141,451 is carried forward. The meeting is to be held on July 26th.

Telephone Manufacturing Co., Ltd.

The report for the past year shows a net profit of £35,234, as compared with £5,427 in the preceding year. A balance of £1,332 brought forward is added, making £36,566. Of this, £12,000 is devoted to the writing-down of new issue expenses, leaving a balance of £24,566 to be carried forward. The curtailment of the demand for telephone apparatus during the year caused that department of the business to suffer, but during the current year an improvement has occurred. The value of orders in hand is now much greater, and the output is increasing. The installation business also shows an increased profit. The meeting was to be held yesterday (Thursday).

Kalgoorlie Electric Tramways, Ltd.

In the course of his speech at the annual meeting on July 12th, the chairman (Mr. C. C. Baker) said that the closing down of mines, with the consequent reduction of population, had adversely affected the company. That effect would continue until something was done to revive the industry. The Commonwealth Government had ordered a survey of the district, and it was quite possible that new lodes would be discovered. A new company had been formed to take over the Golden Horseshoe mine, and that was likely to bring about a considerable improvement in conditions.

Eastern Telegraph Co., Ltd.

The accounts for the year ended December 31st, 1927, record a total revenue of £3,306,909, and a net income of £947,926. After meeting debenture interest and preference dividends and adding £506,625 brought forward, there is a balance of £1,175,765. From this £150,000 has been placed to general reserve and dividends totalling 10 per cent. free of tax have been paid on the ordinary shares, leaving £525,765 to be carried forward. Meeting: July 24th.

Eastern Extension, Australasia and China Telegraph Co., Ltd.

The gross revenue for the past year was £1,978,408, as compared with £2,047,033 for 1926, and the net revenue £1,068,143, against £1,115,975. After the payment of debenture interest, &c., £200,000 is transferred to reserve (against £550,000). Four quarterly dividends of 2½ per cent. each have been paid, free of tax, and £653,621 is carried forward. Meeting: July 26th.

Rothesay Tramways Co., Ltd.

The total receipts for the past year amounted to £19,299, and there was a net surplus of £1,040, to which was added £1,315 brought forward, making £2,355. After the payment of the preference dividend, £1,855 is carried forward. Mr. C. D. Stanley has been elected to the board in the place of Brig.-Gen. C. D. Baker-Carr, who has resigned.

Ross Electric Light and Power Co., Ltd.

The accounts for the past year show a higher revenue and lower working costs, raising the gross profit from £959 to £1,544. Debenture interest, depreciation, &c., absorbed £1,210, leaving £334 to be placed against the debit balance brought forward, reducing it to £6,323.

Brazilian Traction, Light and Power Co.

A quarterly dividend of 44 cents per share has been declared on the no-par-value ordinary shares. This is the first dividend since each $100 share was converted into four shares of no par value.

Anglo-American Telegraph Co., Ltd.

A dividend of £1 10s. per cent. has been declared on the preferred stock and one of 15s. per cent. on the ordinary stock for the quarter ended June 30th.

Parkinson & W. & B. Cowan, Ltd.

The recent issue to shareholders of 50,000 7 per cent. cumulative preference shares of £1 each and 100,000 ordinary shares of £1 each was over-subscribed.

Electrolytic Zinc Co. of Australasia, Ltd.

A dividend at the rate of 12 per cent. per annum has been declared for the half-year ended June 30th, as last year.

Swiss Company.

The *Brown, Boveri Co.*, Baden, has again declared a dividend of 8 per cent. out of a net profit of 4,531,011 fr. (against 4,502,776 fr. in the preceding year).

Stocks and Shares.

MONDAY EVENING.

Hydro-Electrics.

THE influence exerted over the Stock Exchange markets by the sudden death of Mr. Alfred Loewenstein on July 4th is likely to make its effect felt for some time to come, by reason of the forced selling following upon the news of the financier's tragic end. Judging by the statements that have appeared in the Press, it is not necessary to look for liquidation of the late Mr. Loewenstein's shares, but the shock of the news produced heavy falls in prices of the shares with which he was so closely connected, and a good deal of money has had to be provided by speculators to meet the losses which they have incurred by reason of the slump in International Holdings and Hydro-Electrics. Other shares were sympathetically weakened, but the Stock Exchange settlement last week, which was rather expected to produce evidence of financial trouble, passed off without the disclosure of any difficulty. The International Holdings Company is largely interested, as already explained, in a number of American, Canadian and Mexican utility companies, while the Hydro-Electric is concerned with undertakings whose scope is indicated in the company's title. After a substantial rally, the shares of both companies gave way again; and the general impression is that some time will have to elapse before the market in these two shares, which to a limited extent sways that in various other departments, recovers its equilibrium, although both companies are said to be in a sound condition. The removal of the guiding spirit creates a gap which time will fill up, but in the holiday season, when speculative enterprise is dormant, it can hardly be expected that there will be any permanent recovery of a material nature.

Money Rates.

International Holdings now stand at about 14, equivalent to 140, as compared with the 360 reached earlier this year, and Hydro-Electrics have come down from 86 to 35. A few of the Mexican utility issues are heavy, and it would appear from New York advices that the situation in the Wall Street Stock Exchange continues to be a cause for uneasiness, on account of the extensive bull position that still remains. The New York Federal Bank has raised its rate from 4½ to 5 per cent., thereby giving cause for a little apprehension that the Bank of England may consider it necessary to follow suit. The present 4½ per cent. Bank Rate has been in force since April 21st last year.

Brazilian Tractions.

The Brazilian Traction, Light and Power has declared a quarterly dividend of 44 cents on the ordinary shares of no par value, the first announced since the shares of $100 each were split into four others. In future, the dividends will be declared on the basis of so many cents per share, instead of the rate of 7 per cent. per annum that has been in force for some time past. The practice of doing away with a nominal value of a share is of American origin; and, while it grows in popularity on the other side of the Atlantic, its introduction on this side finds little favour in the eyes of many people, whose objection causes them to be labelled old-fashioned, by those who regard the "no-par-value" practice as having advantages over the other system to which the British investor is so well accustomed. The price of Brazilian Tractions has relapsed to 57½.

Cable Stocks Lower.

The report of the Imperial Wireless and Cable Conference has become so well known in advance that its official publication loses any special interest for the Stock Exchange markets in the stocks and shares of the cable and wireless companies. Reference was made here last week to the profit-taking which ensued upon the publication of the details; and, making allowances for the deduction of dividends from Eastern Telegraph ordinary and Eastern Extension shares, the declines on the week come to £1 in the shares of the quartette, and 10½ points in Eastern ordinary stock. Knowledge of the report's provisions robs the prospect of that speculative interest which is the breath of market activity, and therefore the prices have been subject to less fluctuation than usual. There was a sharp fall in the price of Marconi shares, bringing them down from 67s. 6d. to 63s., by reason of sales made, according to rumour, on behalf of Continental holders. The market, however, has a good many supporters, who are always on the look-out to pick up shares on the reaction, and the price rallied to 66s. 3d., leaving it 1/16 down on balance. The £1 shares fell to 4¾.

Melbourne advices suggest that the chief recommendation of the Wireless and Cable Conference is certain to be extremely unpopular in Australia, and the knowledge that the Labour Party is by no means in favour of the scheme for handing over the communication business to private enterprise, is another factor which induces purchasers of cable stocks and wireless shares to move cautiously. Marconi Marines again stand out with conspicuous strength, the price having moved up to 50s. Canadian Marconis reacted to 29s. Amongst telephone shares, United River Plates lost 7s. 6d., falling to 10¾, upon the Board's announcement that the Argentine Govern-

ment has cancelled, without reference to the company, the increase in the company's tariffs authorised nearly six years ago by the previous Government. The company has protested, and referred to the agreement under which all matters in dispute between the Government and the company must be submitted to arbitration.

Eastern Companies' Reports.

The falls in Eastern Telegraph ordinary and of 20s. in Eastern Extensions, Westerns and Globes, are due, as already mentioned, to profit-taking: but the first two companies have just issued reports in which a diminution of earning is reported by both. The shrinkage is, perhaps, less than might have been expected, in view of the particularly active manner in which the Government has pushed its beam system, and the companies' dividends are maintained at 10 per cent., while the companies' reserve funds stand at strikingly large figures. For instance, the Eastern Extension has reserves amounting to nearly 4¼ million sterling, whereas the share capital of the company is 4 million pounds and the debenture stock £752,400. Great Northerns have fallen 10s. to 38½. On the other hand, Indo-Europeans at 45½ have put on 20s. Other members of the cable group are practically unchanged.

Telephone Manufacturing.

The Telephone Manufacturing Company announces a profit for last year of £35,200, being nearly £30,000 better than the 1926 figures, which latter went against a loss of £21,000 in the previous twelve months. The directors write off £12,000 from new issue expenses, leaving £50,000 in that account, and they carry forward £24,500 to the new year. Disappointment is felt at the company not being able to pay a dividend yet, and the price of the shares has gone back to 6s. in spite of the substantial recovery shown in the profit statement. The company is two-sided, one dealing with telephone apparatus, for which, according to the report, the demand last year was small. On the other hand, the installation side of the business has made continued progress, and shows increased profit. The report refers to the curtailment of telephone development, by the Post Office, on grounds of economy. Telegraph Constructions at 25 are ex dividend, and show a loss of 5s. when allowance is made for the deduction. Victoria Falls Power ordinary are harder at 61s. upon an excellent annual report. The dividend is 15 per cent. for the year.

Manufacturing Issues.

English Electric preference eased off to 10s., General Electric ordinary at 39s. 3d. recovered part of the dividend taken off the price last account day. Callenders at 4 3/16, also ex dividend, showed no net movement, and British Aluminiums have gone back to 2 5/16. The cheery speech by the Henley's chairman at last week's meeting produced no effect upon the price of the shares.

Electricity Supply.

Shares in the Home electricity companies continue to improve. St. James' and Pall Mall have risen to 28s., showing a gain of 1s., and Westminsters strengthened to 27s. 6d., movements that suggest a probable appreciation to the same level of value as in the cases of shares of other London companies. A few dividends were deducted from the prices last week, and these deductions have mostly been recovered. Scottish Power continue to advance, the old shares rising to 30s. 6d., the new shares to 3s. 3d. premium. Newcastle-on-Tyne ordinary, on the other hand, are dull at 25s. 9d. A demand for good-yielding investments led to a further improvement of a few pence in Whitehall Electric preference. The Folkestone Electric Supply Company is holding a meeting on Thursday in this week, to confirm the resolutions passed last month for the increase of the capital and capitalisation of part of the reserve fund by the issue of a bonus. The price of the shares is 51s. 3d. Isle of Thanet preference are better at 26s. 6l., the ordinary also being a good market at 34s. Egham and Staines ordinary are quoted at 37s. Richmond (Surrey) Electric ordinary stand at a little over £2. Shropshire "B" preference strengthened to 23s.

Home Rails and Others.

In the railway market, the feature this week has been a strong recovery in the prices of the steam stocks. This came about as a sequel to the passing of the Road Transport Bills, which directed a certain amount of attention to stocks that had fallen heavily in price, and which would seem to be due for a recovery on theoretical grounds rather than any particular expectations in regard to dividends or improvement in trade. Metropolitan consolidated eased off to 68. Underground Electric Railways, after a dip, recovered to 26s. 6d. The Mexican utility group is inclined to weaken: Mexico tramway fives showing a fall of 2 points at 82½. No change has occurred in the Anglo-Argentine Tramways group. The engineering section is marking time, and the rubber share market seems to have gone to sleep. The effects of the mild heat wave and of the holiday season are already apparent in the amount of business, and the daily attendance in the Stock Exchange. New issues continue to appear in considerable numbers. The recently-issued Bermuda Traction debenture has fallen to 5½ discount on sales by some of the underwriters left with 72 per cent. of their subscriptions.

Share List of Electrical Companies.

	Nom. £	Dividend. 1926.	Dividend. 1927.	Price July 16, 1928.	Rise or fall.	Yield. p.c.
HOME ELECTRICITY COMPANIES.						
Bournemouth and Poole	1	14†	15	3	—	... ...
Brompton Ordinary	1	8½	8½	26/6	—	5 5 8
Charing Cross Ordinary ...	1	8½	8½	27/-	—	5 8 8
do. do. 4½% Pref. ...	1	4½	4½	17/6	—	5 2 10
Chelsea	1	8⅝	8⅞	26/6	—	5 5 8
City of London	1	10	10	30/9	—	4 11 1
do. do. 6% Pref.	1	6	6	22/-	—	5 4 4
Clyde Valley	1	8	8	38/6	—	4 3 0
County of London	1	7½	7½	38/6	—	3 18 0
do. do. 6% Pref. ...	1	6	6	22/-	—	5 4 4
Edmundsons' 7% Pref. ...	1	7	7	25/6xd	+6d.	5 9 10
Elec. Supply Corporation ...	1	11	11	51/3	—	4 5 9
Kensington Ordinary ...	1	8	8	26/6xd	+6d.	5 5 8
Lancs. Light and Power ...	1	7½	7½	29/-	—	5 3 5
London Electric	1	8½	8½	26/6	—	5 5 10
Metropolitan	1	8	9	2⅞	—	3 13 9
do. 4½% Pref.	1	4½	4½	17/6	—	5 2 10
Midland Counties	1	6	6½	30/-	—	4 6 8
Mid. Elec. Power	1	—	15	29/3	—	... ...
Newcastle-on-Tyne Ordinary ...	1	5	6	25/9	—6d.	4 13 2
do. 7% Pref. ...	1	7	7	26/6	—	5 5 8
Notting Hill 6% Pref.	10	6	6	10¾	—	5 11 7
North Met. Elec. 6% Pref. ...	1	6	6	22/-	—	5 4 4
St. James' and Pall Mall	5	8	8	2⁹/-	+1/-	5 0 0
Scottish Power	1	8	8	30/6	+6d.	5 5 0
South London	1	8½	8½	26/6	—	5 5 8
Urban Ordinary	1	7	7	31/3	—	... ...
Westminster Ordinary	1	8½	8½	27/6	+6d.	5 1 10
Whitehall Elec. Invst. 7½% Pref. ...	1	7½	7½	23/6	+3d.	6 7 8
Yorkshire Elec.	1	8	8	34/6	—	4 12 9
HOME RAILS.						
Central London Ord. Assented ...	Stock	4	4	78	—	5 9 7
Metropolitan	,,	3	3	68	—½	4 8 3
do. District	,,	8½	4	75½	—½	5 6 0
Underground Electric	£1	1½	5	28/6	—	3 15 6
do. do. Income ...	Bonds	6	6	125	—	4 16 0
TELEGRAPHS AND TELEPHONES.						
Anglo-Am. Tel. Pref.	Stock	6	6	100½xd	—	5 19 5
do Def.	,,	1½	1½	24	—	6 5 0
Automatic Telephone	1	10	10	45/-	—	4 9 0
Eastern Extension	10	10	10	23½xd	—1	*4 8 1
Eastern Tel. Ord.	Stock	10	10	237xd	—10½	*4 4 5
Globe Tel. and T. Ord.	10	10	10	23½	—1	*4 5 1
do. do. Pref.	10	6	6	11	—	5 9 1
Great Northern Tel.	10	20	20	38½	—½	5 4 0
Indo-European	25	10	10	45½	+1	*5 10 0
Marconi	10/-	5	—	66/3	—1/-	0 15 6
Marconi Marine	1	8½	12½	50/-	+1/-	5 0 0
Oriental Telephone Ord.	1	12	12	53/9	—	*4 9 3
United R. Plate Tel.	5	8	8	10¾	—⅜	*3 17 0
Western Telegraph	10	10	10	23½	—1	4 5 1
HOME AND FOREIGN TRAMS, &c.						
Anglo-Arg. Trams First Pref. ...	5	5½	5½	3⅝	—	7 11 9
do. do. 2nd Pref. ...	5	6	6	3½	—	8 2 8
do. do. 5% Deb. ...	Stock	5	5	70½	—	6 5 9
British Electric Traction Def. Ord.	,,	—	—	500	—	... ...
do. do. Pref. Ord.	,,	8	7½	121½	—	6 0 6
Brazil Traction	100	6	7	57½	—5	3 18 3
Brit. Columbia Elec. Rly. Pcc. ...	Stock	5	5	95½xd	—	5 4 9
London & Sub. Trac. 5% Pref. ...	1	Nil	Nil	9/6	—	... ...
London United Tram Deb. ...	Stock	4	4	60½	—	6 12 3
Mexico Trams, 5% Bonds	—	5	5	82½	—2	6 1 3
Mexican Light Common	100	Nil	Nil	75	—	... ...
do. 7% Pref...	100	Nil	7	80	—	8 15 0
do. 1st Bonds	—	5	5	82½	—	6 1 3
Yorkshire (West Riding)	1	Nil	Nil	7/6	—	... ...
MANUFACTURING COMPANIES.						
Babcock & Wilcox	1	13	15	67/6	—	*4 9 0
British Aluminium Ord.	1	10	10	45/-	—1/-	*4 9 0
British Elec. Transformer Pref. ...	1	7	7	18/-	—	7 15 0
British Insulated Ord.	1	15	15	4⅛	—	3 13 6
Brush Ord.	1	10	10	2⁹/9	—	6 19 5
Callenders	1	15	15	4⅛xd	—	3 10 6
do. 6½% Pref.	1	6½	6½	28/9	—	5 9 5
Crompton Parkinson Pref. Ord. ...	1	—	—	17/6	—	... ...
do. 8% Pref.	1	—	8	26/3	—	6 2 0
Edison-Swan	4/-	10	10	12/6	—	8 4 0
do. 5% Deb.	Stock	5	5	98	—	5 13 8
Electric Construction	1	7½	7½	27/6	—	5 9 1
Enfield Cable Pref.	1	7½	7½	26/3	—	5 14 9
English Electric	1	Nil	Nil	8/-	—	... ...
do. do. Pref.	1	8	Nil	10/-	—⅛	... ...
Gen. Elec. Pref.	1	6½	6½	24/6	—	5 6 1
do. Ord.	1	7½	10	53/3xd	+9d.	5 2 0
Henley	1	25	25	5¾	+⅛	4 5 0
do. 4½% Pref.	5	4½	4½	4½	—	5 6 0
India-Rubber	1	Nil	Nil	15/-	—	... ...
Johnson & Phillips	1	12½	10	2	—	5 0 0
Met.-Vickers Ord.	1	8	6	32/6	—	3 13 10
do. Pref.	2	8	8	2⅜	—	6 1 11
Siemens Ord.	1	7½	7½	27/6	—	5 9 1
Telegraph Construction	12	10	10	25xd	—½	*4 16 2

* Dividends paid free of Income Tax.

† 4% of which was Tax Free.

Our Foreign Electrical Trade.

Electrical Exports and Imports during June, 1928.

ALTHOUGH last month's foreign electrical trade statistics appear at first to be unsatisfactory, the position is not so bad as it might be. In comparing the exports with those of the preceding month and of June, 1927, decreases are revealed, but the fact remains that the total was above the monthly average for 1927. At the same time, the import total was also greater than the average monthly imports during last year.

Comparing the items with those of the preceding month, it will be seen that the largest variation occurred in the case of telegraph and telephone instruments and apparatus; another item in the same section—non-submarine telegraph and telephone cables—registered a fall of £13,099. The decline of £19,428 in traction motors was more than counterbalanced by increases in unenumerated machinery and "other" motors and generators; the net increase in the machinery section was £6,694. A satisfactory increase was recorded in insulated wires and cables. As compared with June, 1927, the decline was not so great, although the variations in the individual items were larger. Insulated wires and cables again show up well with a rise of £53,462, while the machinery section as a whole exhibits an increase of £77,655. Against this, however, must be placed a very large decline in the telegraph and telephone section amounting to £113,253; in addition, there were decreases in glow lamps and batteries and accumulators. The exports for the completed portion of the year (six months) show the almost negligible rise of £43,374.

In the import section the decreases and increases were about balanced, with a net rise of £6,591. The principal increases were recorded against unenumerated goods, insulated wires and cables, and meters and instruments. Unenumerated machinery, batteries and accumulators, and carbons showed the largest decreases. As compared with the corresponding month of last year, there was a rise of £22,686, contributed chiefly by unenumerated goods, telegraph and telephone apparatus and insulated wires and cables. Against these increases there were falls in the cases of non-submarine telegraph and telephone cables, batteries and accumulators, and unenumerated machinery. The increase for the first half of the year (£312,289) is far greater quantitatively and proportionally than in the case of exports.

There was a large jump in re-exports in both comparisons, unenumerated goods and machinery being mainly responsible for the rise.

An examination of the individual export items for the first six months of the year reveals large increases in exports of "other" motors and generators (£105,000), telegraph and telephone apparatus (£283,000), and non-submarine telegraph and telephone wires and cables (£90,600). Important decreases occurred in the cases of submarine telegraph and telephone cables (£256,000), batteries and accumulators (£66.000), and glow lamps (£61,000).

The following table shows the distribution of our electrical machinery exports during June, comparing them with those of the corresponding month of 1927 :—

Destination.	June, 1927. £	June, 1928. £	Inc. or dec. £
South America ..	42,291	73,855	+31,564
Europe	70,456	77,884	+ 7,428
Japan	17,772	21.141	+ 3,369
South Africa ...	72,435	32,980	−39.455
British India ...	79,574	155,755	+76,181
Australia	141.578	96,554	−45,024
New Zealand ...	19 681	34,329	+14,648
Canada	20 918	12.712	− 8,206
Other countries ...	70,903	108,053	+37,150
Totals ...	£535.608	£613,263	+£77,655

During the first half of this year the following markets have expanded:—Europe, South America, India, Canada and other countries; the shares of Japan, South Africa, Australia and New Zealand have been reduced.

	Exports.			Imports.			Re-Exports.		
	Electrical exports for June, 1928.	Inc. or dec. as compared with May, 1928.	Inc or dec. as compared with June, 1927.	Electrical imports for June, 1928.	Inc. or dec. as compared with May, 1928.	Inc. or dec. as compared with June, 1927.	Electrical re-exports for June, 1928.	Inc. or dec. as compared with May, 1928.	Inc. or dec. as compared with June, 1927.
Electrical goods and apparatus (unenumerated)	£209,197 −	£ 622 +	£ 6,515	£116,454 +	£15,666 +	£23,134	£9,378 +	£1,890 +	£6,903
Insulated wires and cables ...	282,806 +	52.611 +	53,462	69,548 +	15,049 +	8,497	1,4'0 +	317 +	383
Glow lamps	44,557 −	6,765 −	1?,953	2'.860 −	1,278 +	1,948	885 +	736 +	679
Arc lamps and parts ...	4,874 +	2.663 +	3,439	3,161 −	957 +	713	4 +	4 −	69
Batteries and accumulators ...	94.025 +	1.385 −	17 419	39,130 −	8.310 −	7,493	666 −	306 +	406
Meters and instruments ...	31,477 −	7,?71 +	1,'29	27.461 +	8,522 −	1,913	571 +	251 +	370
Carbons	340 −	568 −	1,119	7,387 −	7,017 +	289	17 −	138 −	41
Switchboards (not telegraph or telephone)	4,461 +	16 −	883	323 +	295 +	278	— −	25	—
Electrical Machinery—									
Electrical machinery (unenumerated)	354,661 +	22,625 +	62,673	134,794 −	12,334 −	5,029	20,103 +	7,282 +	12,015
Railway and tramway motors	44,948 −	19,428 +	8,242	—	—	—	—	—	—
Other motors and generators ..	213,654 +	3,497 +	6,740	—	—	—	—	—	—
Telegraph and Telephone Cable and Material—									
Telegraph and telephone wires and cable (not submarine)	59,005 −	13,099 −	49,550	4,826 +	1,810 −	7,735	16 −	51 −	16
Submarine telegraph and telephone cable	15,912 +	5,611 −	354	—	—	—	—	—	—
Telegraph and telephone instruments and apparatus ...	215,094 −	64,851 −	63,349	45.660 −	4,855 +	9,667	2,482 +	378 −	962
Totals	£1,574,951 −	£24,299 −	£10,557	£474,604 +	£6,591 +	£22,686	£35,552 +	£10,338 +	£19,698
		Exports.			Imports.			Re-Exports.	
Increases for first six months.		+ £43,374			+ £312,289			+ £37,128	

Electrical Contractors' Conference.-IV.

Proceedings at Cheltenham.

Trading Without Tears: The E.C.A. Policy.

By HOWARD MARRYAT, M.I.E.E.

(Abstract.)

THE electrical industry is looked upon with envy by all those who are not directly connected with it. To the onlooker it appears to be a gold mine; and he has good reason for thinking so. In spite of this it can be shown that the electrical industry, particularly in certain vital sections, is working upon a very narrow margin of profit. According to Garcke's "Manual," in 1926-27 eight hundred million pounds was invested in electrical enterprise, of which two hundred and eighty millions represented electricity supply and ninety millions manufacturing interests. With a supply output for the year of 6,500 million kWh, the manufacturing output for the same year was valued by Mr. D. N. Dunlop at "not far short of £100,000,000." The national importance of the electrical industry is not to be gauged from electrical statistics alone. Sir Hugo Hirst, Bt., has said that electrical manufacture has its repercussions through a great complex of industries, some of which it affects immediately and others only indirectly. The national importance of the electrical industry is emphasised by the attention given to it by the Committee on Industry and Trade.

It is stated in this Committee's Report that among electrical manufacturing concerns alone, there was an amount of nearly ten million pounds of ordinary, preference and debenture capital upon which no dividend or interest was paid during the year under review (1926-27), while another ten millions of ordinary, preferred and loan capital secured a return to its holders of 5 per cent. per annum, *or less*. Certain specialised sections of the industry earn larger returns on their invested capital, but the B.E.A.M.A. has shown that, among electrical engineering concerns last year the net profits recorded were only 3.5 per cent. of the total turnover. The reason for this condition of things may perhaps be found in the highly technical nature of the business which has placed at the head of affairs many whose qualifications are technical rather than commercial. Apart from the natural dissatisfaction which arises from the long hours and small salaries incidental to an industry showing a small return for capital, everyone feels he is the victim in some way of unfair trading. There is evidence of overlapping and duplication of effort everywhere, and in place of the confidence which exists between manufacturers, wholesalers and retailers in the older industries, there is, too often, mistrust and suspicion, with its attendant lack of co-operation and enterprise. In searching for the cause of this unrest, one finds a state of disorganisation and duplicated effort which is frittering away the resources of the producer and seriously reducing the efficiency of every sales effort. For instance, the manufacturer is generally not content to distribute his goods only through the medium of a wholesaler, but he must set up his own sales organisation and approach the retailer direct. Sometimes he even canvasses the actual users. For this purpose the user is often termed a "trade user" and is granted trade terms. These so-called "trade users" constitute the only buyers who take sufficient material regularly to support a strong and healthy retail trade. Without this custom the retailer cannot carry either the staff or the stock needed to keep his business the live thing it should be. The result is that the man who puts his brains and his capital into the retail side of electrical distribution has a difficult time. He must camouflage the name of his supplier or his customer will buy direct, and he must suppress the name of his customer from his supplier. The wholesaler complains that the manufacturer quotes his retailer wholesale terms, and that often the manufacturer gets to the retailer's customer before he, the wholesaler, has a chance to do so. Many manufacturers, and wholesalers, take the most elaborate means to ensure the protection of their customers; but, for all that, most unfortunate incidents continue to take place daily. The manufacturer's complaints against the retailer are often justified. More often than not they concern an alleged lack of enterprise, a charge which ignores altogether the unwritten trade law, fully recognised in older industries, that, without confidence between the parties, enterprise cannot exist. The retailer daily takes risks and enters upon adventures which would make the average manufacturer or wholesaler shudder, and this with little hope of any continued reward from his work when it is completed. In every well-organised commercial concern, operating under a managing head, maximum efficiency is attained by confining sales to the sales side and crediting the individual concerned with all that is done in his district or in his commodity. In the electrical industry the retailer will do no spadework so long as there is the remotest chance of his supplier going to his customer behind his back. Confidence in the fixity of terms from the manufacturer down to the consumer is what is needed to reduce the cost and retail prices of electrical commodities, and establish a basis of reasonable profit to the industry. The manufacturer should have his output assured well in advance by his main distributing agents. He should have nothing to worry about beyond the improvement of his designs and the reduction of works costs. The wholesaler should take the risk of putting new designs on the market, and make it his sole business to distribute to established and accredited retailers, under conditions of a small profit and assured trade. Under these conditions, the retailer, with renewed enterprise and capital, would throw his whole energy into the business of reaching every possible buyer. With the help of a graded quantity discount he would more than satisfy the so-called trade users, at the same time encouraging those bulk orders which are so helpful in reducing the ratio of standing charges to turnover.

The Electrical Contractors' Association came into being largely for the purpose of improving trading conditions, and upon the purely contracting side of the business its efforts have not been without reward. In its early days the Association convened the first meeting of manufacturers, and formed the National Electrical Manufacturers' Association, now reconstructed as the B.E.A.M.A. Although it has never been able to maintain a general agreement with this body, frequent joint meetings have been responsible for the greatly improved conditions which now exist. The E.C.A. has also been able to make many sectional agreements which have greatly benefited the parties and served to support British industry and labour. In the negotiation and drafting of these agreements there has been a consistent widening of the point of view. The idea of immediate gain has merged into the broader conception in which individual interests are seen to be so entirely wrapped up with that of the industry as a whole, that an agreement, to be successful, must protect all parties, and finally secure better treatment for the consumer. With this funda-

Panora, Ltd.] **Members of the E.C.A. Allied Associations, Visitors and Friends photographed in the—**

mental idea in mind the Association formulated its Trading Policy in 1923. The work was entrusted to a strong committee, which, before presenting its report, took into consultation leading manufacturers and wholesalers, who freely gave their opinions and advice. The policy met with good will in many quarters, and it has run the gauntlet of five succeeding E.C.A. Councils without the amendment of a word or the addition of a comma. Contractors take the view that more work will be done and more profit earned if prices to the consumer are reduced. To arrive at this main object the policy seeks to reduce manufacturing costs by assuring to the manufacturer a bulk demand well in advance; to eliminate the redundant middlemen; to relieve the manufacturer of selling and distributing expenses amounting to from 20 per cent. to 200 per cent., according to the nature of the goods; and to allocate all retail sales to the retailer, so enabling him to reduce the percentage of his oncost and the necessary margin of profit.

The suspicious will suggest at once that this is a selfish policy for a retailer to advance, but the fulfilment of the policy must be a matter of time, and those responsible for its conception can have little personal interest in the result.

Dealing with the four main lines of the policy, it seeks first to assure to manufacturers a bulk demand in advance. The arrangement between the manufacturer and his wholesaler or wholesalers would be in the nature of a net price contract based upon actual works costs for the quantity dealt with, the fixation of list prices and discounts being entirely a matter for the wholesalers concerned. Clause 3 (*b*) states that contractors and retailers shall support the industry by buying in quantity. The practical conception here is in the nature of a quantity discount offered by the supplier to secure bulk orders from his retailers. In Clause 7 the idea is further elaborated and the principle of quantity discount distinguished from trade discount "so as to eliminate the wasteful expense attached to small parcel buying." In Clause 7 the trade discount is "reserved exclusively for re-sellers," thus clearly implying that the quantity discount is to be passed on to the user if he can buy in the necessary quantity. With the certainty of demand secured in advance, the works manager will quickly devise ways and means of reducing costs—often with a vastly improved production. The wholesaler dealing with the whole retail market, and nothing but the retail market, will be able to judge in advance what his demand will be. In a sense he will create that demand himself, and it should be his expert knowledge of the trade which should support the manufacturer and secure the highest manufacturing efficiency. The genuine wholesaler has found his place and is working efficiently in most industries, but wholesaling in the electrical industry is so far largely a failure. Practically all electrical manufacturers have set up their own selling and distributing organisations. Then, when the wholesaler comes, not in ones or twos but in hundreds, and demands very naturally a better price than the retailer obtains, the manufacturer has only one course open to him. He must advance his gross price. There are about 10,000 people in this country who call themselves electrical contractors. They are, however, mostly only wiremen. In addition, there are about 2,000 electrical shopkeepers. Of the total of 12,000, only 5,000 could be genuinely classified as retailers. As there are 1,000 people obtaining wholesalers' terms, it follows that there is one wholesaler, or factor, as he is sometimes called, for every five retailers. This means that the retailer and his customer must both pay more for their goods, unless, as so often happens, they are smart enough to get behind the back of the man in their way. Under the policy only those wholesalers who genuinely reduce distribution costs and support the manufacturers with large quantity buying are to be given preference in price over the retailer. The third aim of the policy is to cut out the manufacturer's selling expense. This is not capable of universal application. The man who makes heavy plant or highly specialised commodities will require to carry through the whole of his transactions direct to the user. Nevertheless, it is reasonably contended that wherever a manufacturer finds it possible to do his business through his own paid local agent, that business could be more economically conducted through a retailer. In the case of material requiring special technical knowledge, this might well mean the appointment of a particular retailer to act as agent for a district. It is an object of the Association that its members shall undertake the running of showrooms and generally introduce new inventions and designs to the user. In other words, the retailer shall carry the whole expense connected with direct sales. It is he who should know best what expense is justified and what is not. It is he who understands best the local conditions and knows the local people. In Clause 4 (*b*) it is foreshadowed that eventually the manufacturers and the wholesalers shall do no more than advertise their goods and so create a demand which the retailer shall fill. In any successful undertaking the cost of advertising must be borne by the final purchaser. It is, therefore, immaterial whether the manufacturer or the retailer or the wholesaler spends the money, except that the manufacturer or the wholesaler, as the case may be, is better able to organise a campaign economically than a lot of detached retailers. On the other hand, the retailer may be relied upon, in the course of his own local advertising, to push those things which his supplier has already brought into popular demand.

The policy is being pursued by the Association in the belief that it will lead eventually out of this sea of discord to a land where trade is conducted without tears. The policy has been received with sympathy by friends among both manufacturers and wholesalers, and there are indications that general agreement to bring about its main objects would not be unwelcome. Every man has a right to manage his own business in his own way so long as he breaks no agreement that he has entered into. Firms who have already established elaborate sales departments for reaching the public direct will not disband them at once even if they see the virtue of a better way. A practical course would be first to educate traders to a sense of the advantages to be gained by a better trading system, and invite them, individually, and by groups, to declare their policy. For this purpose a thoroughly competent body appointed by a committee of the various interests concerned might set out what it considers to be the best and most economic terms of trading for each section of the industry, and firms willing to do so should declare their willingness to adopt this clause or that, or all the appropriate clauses. Such a declaration should be subject to penalties for breach, and the joint authority, with the aid of paid officials, should have power to arbitrate upon and to settle any differences or complaint which might arise. When a comparatively few concerns had linked themselves together in this way there is little doubt that many others would quickly seek the advantages of similar co-operation. Existing methods would not be scrapped immediately. That course would follow gradually as the economic law dictated, but the mere declaration of policy and a fixed tribunal of appeal would at once engender a fresh confidence now lacking. This joint authority would institute a register such as the lamp makers and valve makers have at present, in which the precise status and the terms applicable to various firms are recorded for reference. The first practical step is to discover who, besides the contractor, is sufficiently interested to take this initial step.

—Town Hall Gardens on the occasion of the Annual Conference at Cheltenham, July 5th, 1928. [*London.*

Discussion.

The discussion was initiated by a representative of the wholesalers, Mr. A. G. BEAVER, who said that there was undoubtedly a lack of confidence between members in each branch of the industry—not only between branches. There was a need for all parties to place all their cards on the table. The manufacturer should certainly confine his attention to manufacturing as in the older industries. The electrical wholesaler had a wide and expert knowledge of the trade, and was in the best position to handle the manufacturers' output. In the business covered by the contractor too many manufacturers acted as wholesalers, even for other products than their own. The term "trade user" covered a multitude of sins; "registered user" was a better name, and that user should be under the control of the selling section of the industry. There were,

however, a few manufacturers and wholesalers who endeavoured to run straight. The Association's Trading Policy would take a long time to come into effective operation, especially if it was not altered in several respects. What were, for instance, bulk orders? Did any contractor place large orders unless he wanted them for a definite contract? The contractors had been spoiled by those manufacturers and wholesalers who were anxious to supply the smallest orders. The contractor lived from hand to mouth, and some so-called wholesalers even peddled their goods from door to door. It was probable that trade discounts were too high in some directions. To rely on high trade discounts was uneconomical and bad trading. The speaker considered that the contractor was to blame for a great deal of the trouble for supporting unfair factors and manufacturers. He was sceptical as to the proportion of wholesalers to retailers; the Electrical Wholesalers' Federation had fewer than 100 members, and their credentials had been carefully scrutinised. He concluded by saying that the policy was drafted with a genuine desire to better conditions in the industry, and he hoped that Mr. Marryat's paper would stimulate efforts in that direction.

Mr. T. R. MARTIN (J. H. Tucker & Co., Ltd.) considered that there had been enough talk about bettering conditions, and action was now imperative. The industry was full of goodwill, and if every section meant what it said, it was unfortunate that they got no further. All kinds of traders were getting money which should remain in the electrical industry. What was needed was a man—a general manager, dictator, or "czar" of the industry—who should be well paid and given a free hand. This man would hear the views of all parties and then give decisions which all sections would abide by. He claimed that the system had been successful in the United States. The *bona-fide* contractor must be supported by the manufacturer and wholesaler if the industry was to be put on its feet. The contractors themselves could do as much as anybody to that end.

Mr. J. ORRINGE was satisfied that the contractors had the goodwill of all other parties—but they could not live on goodwill. Under existing conditions trade discounts were not too high; under proper conditions they could be reduced. They needed more enthusiasm on the sales side of the industry, and contractors would be enthusiastic if there was a settled policy. For instance, there had been uneasiness in the provinces with regard to the purchasing of lamps by municipal authorities. Previously they went to contractors, but now they could secure the full trade discount, and the retailers had lost the trade. That policy of the manufacturers must cease. The question of eliminating the redundant middleman was in the contractors' own hands. A considerable amount of "trade user" business belonged to the retailers, not to the wholesalers. There was no reason why contractors should not also be manufacturers or wholesalers so long as they "played the game." The co-operation which existed at Leicester had been misconstrued by manufacturers; the contractors were assisting the municipality, and the manufacturers, to sell appliances—they were not just snatching discounts. Manufacturers should realise that they were out for a square deal.

Mr. W. CROSS said that contractors had been frequently accused of lack of enterprise. That was entirely due to the poor trading conditions. Manufacturers and wholesalers took business from them when they had made it worth while. The discounts upon the larger appliances, such as fires, should certainly not be reduced, for the contractor had sold the idea of electricity as well as the appliances. Of course, if contractors did not do their share in spreading the electrical idea discounts were too high. One bad feature of existing conditions was that manufacturers would give full trade discounts, however small the quantity; the wholesaler and manufacturer should refuse to sell less than standard packages. He was firmly of the opinion that there should be one discount for all types of goods, and, in addition, a substantial quantity discount in which the "trade user" would never participate. That arrangement could be applied to the wholesaler by the manufacturer and to the contractor by the wholesaler. He supported the formation of a strong joint committee to administer conditions.

Mr. E. A. HARVEY thought that one cause of the present condition of the industry was that manufacturers of large plant had entered the small appliance field and were unable to produce those small appliances at a profit. The wholesaler had to be driven by the contractor, for he had no enterprise. He left the contractor to find out if there was a market for articles. Another cause of trouble was the over-systematisation of some of the larger firms which added to the cost of small articles.

Mr. LL. B. ATKINSON pointed out that the electrical trade was not the only one which suffered from the indiscriminate granting of discounts. After mentioning the satisfactory arrangements which existed between the E.C.A. and the Cable Makers' Association, the speaker said that there was a large class of goods which could not be stocked, and in that case the manufacturers found it better to deal directly with the actual users. It was impossible for *all* goods to be supplied through wholesalers. If manufacturers shut down their selling organisations they would be in the hands of wholesalers in the various districts, which they would not consider satisfactory. If the manufacturer did not deal with large buyers the wholesaler would, and still the contractor would not benefit. Then, again, manufacturers could not refuse to supply any wholesaler, even if they knew that there was really no room for him; if they did they would be accused of discrimination and the restriction of trade.

Mr. P. A. BENNETT considered that there was no room in the electrical industry for the wholesaler or factor. After all, the number of electrical contractors was limited, which would enable manufacturers to deal directly with them. There was no need for a retailer to stock many makes of the same article.

In replying to the discussion, Mr. MARRYAT said that contractors were very satisfied with their agreement with the C.M.A. There would be room for more retailers if the Association's Trading Policy was adopted. He agreed that there was a necessity for a strong tribunal with a strong independent man at its head. Retail selling was an expensive business, as every manufacturer and wholesaler knew, and the retailer could do it cheaper and better. He thought that, upon investigation, Mr. Beaver would find that a fair number of the small invoices which he had mentioned were for "trade users." (Mr. Beaver, interposing, said that the proportion was negligible.) The redundant middleman was supplying almost entirely to people who should be the retailer's customers. The E.C.A. list of genuine wholesalers included only between 50 and 60 names.

Concluding Address.

By W. H. WALTON (President-Elect).

(*Abstract.*)

In the course of his address Mr. Walton said that Mr. Shaw had already dealt very fully with the past activities of the Association; concerning the future, he considered that their efforts must be directed along three main channels: (1) To the development of the Association itself; (2) to the promotion of better trading understandings with all other sections of the electrical industry; and (3) to securing the closet possible co-operation with all electricity supply authorities. The vast majority of electrical contractors of first class standing in this country were already members of the Electrical Contractors' Association; and in the natural order of things the time had now come when applications for membership should be scrutinised very carefully indeed. They must see that members taken into the Association were genuine and reputable installation engineers who would be a credit to the industry and could be depended upon to fulfil their obligations and responsibilities to the public. Membership of the E.C.A. must become generally recognised as the hall-mark of installation efficiency, service and probity. They were, of course, fully prepared to cater for the small man, but they must insist that prospective members of the E.C.A. should prove their technical ability to carry on the work they undertook, and also that they possessed the business resources and equipment necessary to give the public, and therefore the industry, proper service. The Association represented an important buying organisation within the electrical industry, and ways and means were certainly to be found to apply that buying power, to the general good. Trade agreements must not be permitted to prejudice the consumer. In the last account it was the consumer that paid, and therefore the consumer was entitled to the best possible terms and treatment that they could provide. It was absolutely impossible to provide sound public service unless all sections of the electrical industry agreed to get together and work together on fair, well-defined and firmly maintained lines; and no more important work than this lay in front of them at the present moment. Electrical contractors were beginning to tire of academic debate and procrastination. They were determined to get down to business. Manufacturers and others had every right to expect electrical contractor re-sellers to display their goods, to provide efficient "service," and to educate the public in the manifold uses of electrical energy, but they must see to it that the electrical contractor was given a square deal in return. He believed in quantity discounts whereby the large buyer enjoyed preferential terms by reason of his large quantity buying; but there must be no interference with trade discounts as such. It was essential that a very definite line of demarcation be laid down between the purchaser for his own use and the purchaser for re-sale. Quantity for quantity, the buyer for re-sale *must* enjoy a fair preference over the buyer for his own use. By the working of the "Agreed Clause" in the 1926 Electricity (Supply) Act, a degree of co-operation and mutual support already existed between many important supply authorities, and their local contractors; that was of the utmost value to both parties *and* to the public. Prominent electricity supply engineers had paid public tribute to the excellent results obtained as a direct consequence of the "pull together" spirit established in their areas; and no effort must be spared to foster and develop that outlook until it had spread its benefits over the entire country and trade. The electrical industry had grown into vigorous manhood, and it was no more than just that those who had fought through the difficult times experienced by the trade in the past, should have an opportunity of sharing its adult prosperity to-day. Fair and useful co-operation involved a measure of give and take on both sides, and he wished to give as clear an intimation as possible that the Council of the Association would not "stand for" unequal or unreasonable treatment no matter from what section of the industry such suggestions might emanate.

The Public Lighting Conference.

An account of the proceedings at the conference and annual general meeting of the Association of Public Lighting Engineers at Sheffield.

AT the opening of the general conference (July 9th to 12th) in the handsome City Council Chamber at the Sheffield Town Hall, the chair being occupied by the president (Mr. Alex. C. Cramb, M.I.E.E., M.I.Mech.E., borough electrical engineer of Croydon), a civic welcome was extended to members of the Association of Public Lighting Engineers by the Lord Mayor (Ald. M. Humberstone, J.P.), who is himself a member of the Sheffield City Lighting Committee. He remarked that Sheffield was particularly interested in public lighting, for before it was fortunate enough to secure the services of Mr. J. F. Colquhoun as its lighting engineer in 1924, Sheffield was rather looked upon as something of a dark spot. When Mr. Colquhoun was appointed Sheffield had 11,112 gas lamps and only 287 electric public lamps, whereas to-day the city had 13,988 gas lamps and 2,176 electric lamps. It was not only in the number of lamps that the City had improved, but even more so in the lighting value of every lamp; undoubtedly Sheffield had to thank largely the Association of Public Lighting Engineers for this improvement, because it was through such organisations that the responsible officers got together to compare and discuss new ideas and methods. Sheffield still had a problem in the need for better lighting of a number of small courts and alleys, but the Lighting Committee was now tackling this matter very definitely.

The Corporation was particularly anxious, in these days of crowded and fast-moving traffic, still further to improve the lighting of main streets, especially its tramway and motor routes, and its lighting engineer was engaged in important experiments for that purpose. The Lord Mayor congratulated the Association on having chosen as its new president so distinguished a lighting engineer as Mr. Colquhoun, and said Sheffield felt greatly honoured by the choice.

The President (Mr. A. C. Cramb), in thanking the Lord Mayor for his welcome, said the lighting engineers of the country knew Sheffield as a great city with a great reputation in industry, and its reputation in lighting to-day was by no means small. The motion was seconded by Mr. S. B. Langlands, J.P., of Glasgow (foundation-president of the Association), and passed. Following the election of 25 new members, the new president was inducted by the retiring president, who paid high tribute to the reputation and skill of his successor and also to the perfection of arrangements made by him for the Sheffield Conference.

The new president called on the Lord Mayor to present handsome lithographic plates, expressing appreciaiton of their services to the Association, to the four past-presidents—Mr. S. B. Langlands, J.P. (Glasgow), Mr. C. S. Shapley (Leeds), Mr. Robert Davidson (Newcastle-on-Tyne), and Mr. Alex. C. Cramb, M.I.E.E. (Croydon).

The Conference was the most important yet organised by the Association. The chief item on the programme was naturally the display of lighting fittings, occupying about eight miles of streets, arranged by Mr. J. F. Colquhoun, city lighting engineer. There were in all 50 distinct installations, and practically all the leading types of lanterns and street-lighting accessories were represented. The chief object of this display was to afford a practical demonstration of the working of the Standard Street-Lighting Specification and to show various methods of meeting its requirements. We believe that the idea originated in a suggestion made by the late Mr. L. Gaster at the Conference of the Association in Brighton last year. Certainly no better method of making the specification familiar could have been devised, and the records obtained should prove of considerable service to the committee of the B.E.S.A., which paid a special visit to Sheffield.

It would appear that the dominant impression received was the important parts played by glare and visibility in street-lighting problems. In his address Mr. Colquhoun suggested that, judging by his experience, a glare coefficient ("G") of 10 (the limiting value suggested in the specification) would be intolerable; apparently in no case at Sheffield was this value attained, yet in many instances the effect of glare was unmistakable. Recognition of this point seems likely to modify the traditional acceptance of uniformity of illumination as a criterion of good street lighting. Extreme uniformity of illumination can scarcely be attained without high "peak" values of candle-power, which, occurring as they do at angles slightly below the horizontal, tend to accentuate glare. The useful paper on visibility read by Mr. J. M. Waldram, which contained an instructive survey of the effect of reflection from shiny road surfaces, helped to confirm this impression. Most forms of modern road surfaces quickly attain a considerable degree of polish under the wheels of motor vehicles, with the result that distribution of brightness may depart very widely from distribution of illumination.

Another point that struck one in connection with this Conference was the good relationship that exists between the public lighting engineer of Sheffield and the street-lighting authorities, and the evident pride taken by the latter in the illumination of their streets. We trust that one result of the Conference will be to encourage the appointment of qualified public lighting engineers in all the chief cities of this country.

It was announced that the Conference next year will be held in Bournemouth.

Presidential Address.

By J. F. COLQUHOUN (*Public Lighting Engineer to the* CITY OF SHEFFIELD).

(*Abstract.*)

We have passed an important milestone in our history during the past year in that we are now incorporated, the licence having been obtained from the Board of Trade on January 21st last.

From the opinions expressed at our Conference at Brighton last year it was clear that there was a desire that the standardisation of illuminated road signs and traffic signals should be considered: a special meeting was called in London in February last, and was well attended, at which a resolution was carried that the British Engineering Standards Association be asked to form a representative committee to deal with the subject; so far no further steps have been taken, but I hope that some definite announcement will be made at our present Conference.

Our membership has increased during the year from 113 to 146.

The British Standard Specification for Street Lighting was very clearly expounded at last year's Conference, and I felt that an actual demonstration was essential to test out the various claims made. Accordingly I have, with the full appro-

val of my Committee and the interest of the Department of Scientific and Industrial Research, the National Physical Laboratory, and with the help of the makers of street-lighting apparatus, erected 47 installations to demonstrate the various classes of the British specification, not to demonstrate the merits or demerits of any particular makers' goods. (Data on the installations and comparisons of various features thereof form the major portion of the address.)

In viewing the installations I have been struck by the fact that effective illumination is not always attractive illumination; I do not mean the fittings used, but the lighting itself. Possibly lighting with a minimum below 0.1 foot candle may be helped out in attractiveness by contrast of illumination; a minimum above 0.1 foot candle may not need that contrast. Installations equal in minima illumination are equal in effectiveness; if they differ in maxima illumination they differ in attractiveness and only very slightly in effectiveness. The one with the greater contrast is the more attractive, so long as the ratio minimum to maximum illumination does not exceed about 40; over that figure contrast seems to me to become unattractive. All this, of course, is assuming that the installations are free from objectionable and discomforting glare. Brightness of the road surface brought about by the rays of light striking the roadway at oblique angles does help the effectiveness of the illumination on the road surface, but it is difficult to do this without creating tiring, harmful, or at least discomforting glare which, in its turn, impairs visibility. Paragraph 40 on page 18 of the Specification is as follows: "Such evidence as is available tends to show that when the coefficient 'G' does not exceed 10 glare is not likely to be objectionable." I do not wish to anticipate the results of the very careful investigations at present being carried out by the staff of the National Physical Laboratory on these installations, but I shall be surprised if it is not found that the paragraph referred to requires reconsideration. An installation with a glare figure equal to 10 would be, I think, extremely glaring, and because of this glare the visibility would be much reduced.

Does the demonstration prove the specification? I say quite confidently that it does. If the installations are arranged in the order of their minima illumination they do form themselves into what would be the order of preference from the point of view of effectiveness. If arranged in their order of maxima illumination, again from the point of view of effectiveness, obvious contradictions will result.

The glare clause might be made mandatory in order to prevent, or handicap, an installation with a high minimum illumination and considerable glare, and I would suggest also for consideration a change of distance between the lamps from "actual" to "effective" distance.

I submit that, on the whole, the specification has come through the test of this demonstration creditably, and it should be put into operation in every city and town in the country. If this is to be done properly Lighting Departments will require to be much better staffed and equipped in the future than they are now. Let me give you one instance: in fitting up this demonstration we found in a certain case that it was impossible even by the most careful adjustment to get the illumination on the road surface which we knew we should get from the distribution of light given by the particular refractor used. Eventually we found that the outer globes by absorption, plus uncontrollable refraction of light by the outer globes themselves, and also possibly by internal reflections, were entirely cancelling the effect of the prismatic glassware. We took the outer globes off and the minimum illumination was raised from 0.275 to 0.45 foot candle.

Votes of Thanks.

Councillor R. H. MINSHALL, chairman of the Sheffield Lighting Committee, proposing thanks to the President, said he wished to add the welcome of the Lighting Committee and also of the Sheffield Watch Committee to that given by the Lord Mayor. He fully endorsed everything said by the President in his criticisms of many local authorities in the matter of deficiencies in the provision of proper accommodation and staffing for public lighting engineers' departments. He hoped the Association would have the utmost success in its efforts to have public opinion on this matter, for he did feel that there were still local authorities in this country which had not risen to the realisation of what the public lighting engineer of to-day was. He was proud to believe, however, that the lighting authority of Sheffield did appreciate and recognise the importance and value of street lighting and of the officials responsible for its maintenance.

Mr. C. S. SHAPLEY (Leeds) seconded the vote of thanks, which was passed.

Non-manual Control of Lamps.

Two papers on the non-manual control of public street lighting were read, one by Mr. E. H. Horstmann, F.B.H.I., F.R.S.A., M.N.S., Associate A.P.L.E. (Bath), who dealt with the gas aspect of the subject, whilst the electrical point of view was put forward in another paper which is abstracted in the adjoining column.

Automatic Control of Light.

By ERNEST E. SHARP, A.M.I.E.E., F.B.H.I., Assoc.A.P.L.E.

(Abstract.)

The details common to both gas and electricity for public lighting are very little in evidence from the point of view of automatic control. Remote control is possible by a greater number of methods electrically; four methods are in use with two other possibles, besides the rarely used method of switching direct from the power or sub-station. I believe with gas the only *practical* methods are by clock and by pressure, with one other *possible* way. For the control of electricity the clocks never have the protection of the lantern and the help of a by-pass flame to keep off condensation and the worst extremes of cold. With electricity the absence of a by-pass increases the saving to be effected by automatic control. Of all the forms of control mentioned, time switches are the only automatic means that share with hand-switching the possibility of universal application.

Direct switching from the station, although not usually automatic, means laying mains (or at least one extra core in a cable) for no other purpose than to carry the street lighting; I doubt if it can ever be justified on cost. Of the impracticables, the selenium cell is never likely to be of more than scientific interest. Also impracticable for street lighting is the "Aga" system, which is used quite a lot for harbour and similar lighting. It works by the difference of the heat absorbed from light shining on two rods of metal, one of which has a matt surface and the other a brightly polished one. As in the case of the selenium cell, the impossibility of screening from extraneous light is one of the items that put this method of control out of court.

Of methods actually in use, the "Olipel" system operates by superimposing an alternating current of comparatively high frequency on to the existing lighting mains. Relays are connected at each switching point, unaffected by current other than that of the ripple frequency at which they are set to work, and different groups can be operated at different times by using several frequencies, or by the same frequency being subjected to mechanical interruption of varying degrees. This system is adaptable to any existing network without alteration to any of the mains, but is rather expensive as the whole outlay at the power station must be incurred even if only two or three relays have to be operated to begin with. The cost of the station equipment is from 10s. to 20s. per switching point, which must be added to the cost of the relays, which is, approximately, the same as that of time switches. At five places this system is employed at the present time, namely, Leatherhead, Winchester, Douglas, Tilbury, and Maidenhead. It is fascinating technically, but has very limited possibilities.

I believe that everyone is now satisfied that time-switch control is cheaper than hand-switching, while the advantages of not being dependent upon the human factor for this important work are generally admitted. Where lamps can be conveniently grouped so that only a few large-current switches are required, the case for time switches is overwhelming. As an instance of the saving to be effected, even where a separate switch has to be put on each post, I will quote just one case as being a fair average, namely, Leyton, where on an installation of 1,850 time switches, the net annual saving is 14s. per post per annum. My experience in other directions has shown me that this saving is never less than 12s. per post per annum, while in some cases it is more than even that at Leyton.

A really good time switch has a life of 20 years on street lighting, and during this time the maintenance would be mostly confined to oiling and winding the clocks, with an occasional replacement of some small part, or perhaps of burnt-out contacts in case of a short circuit damaging them before the fuse operated; 5 per cent. per annum for maintenance is ample to allow in the case of small switches, and as clock maintenance is much the same in cost on the larger size switches, the percentage in this case becomes a very small one on the first cost of the switch.

To sum up: (1) hand-switching is out of date, unsatisfactory, and by far the most expensive; (2) of all other forms of switching, time switches give the cheapest method that is practicable in every circumstance, and without addition or alteration to existing station equipment, or mains.

Discussion on Joint Papers.

Mr. B. KELLY (Douglas, I.O.M.) regretted that members had not had the advantage of copies of the papers a few days in advance, which would have made a fuller discussion possible. Mr. Sharp had dealt with control systems very fairly and well, but he had observed that "a technical disability from which the ('Olipel') system must also necessarily suffer is the limitation of the impressed voltage, which is usually 2 to 3 per cent. of the normal supply voltage, and never more than 10. Unless mains are in an extremely good condition, it is difficult to maintain this voltage throughout a large system." Mr. Kelly said that he had at Douglas a very large system, and from his own experience he questioned whether the good or bad condition of mains had really very much to do with the question. On his own system he had about 1,200 of these relay switches, about one-third of which were in connection with public lighting. The impressed voltage at the station was 6 or 8 volts, and although this ripple

voltage fell to one volt, or even less, that did not of itself prevent the switch operating. Mr. Kelly did not recollect noticing in the paper any reference to the flexibility of the resonant switch system. He thought that was one of the chief advantages. As Mr. Sharp had indicated, the cost of time switches and relays was about equal, but as an offset to the cost of the rippling plant they had in the case of the clock switches the annual cost of winding the clocks. Probably, of course, the author would reply that cost need not be material because the winding could be done at the same time as the necessary attention for maintenance of the lamps. Mr. Kelly said he would like it to be clearly understood that he was not advocating either one system or the other, or neither. There was still much to be said for what Mr. Sharp had described as direct switching from the station.

Mr. HARRISON (London) said he had been puzzled to know whether Mr. Sharp was an optimist or a pessimist. Personally, he felt sure that what was used to advantage for such purposes as aerial-way and sea-buoy illumination (things that had to be left for many months, and on which so much depended) might one day be recognised as useful for street lighting. He was more optimistic about the future of these systems than Mr. Sharp seemed to be in the later stages of his paper. One point on which he would very much like some further information if it could be got (especially after Mr. Horstmann's delightful description of time switches for gas lamps) was how could lighting engineers obtain time switches for electrical use as cheaply as the gas people seemed able to get them? They both had to do the same job; why should there be such a difference in price?

[In view of pressure on time, the discussion was deferred until the next day, when it was resumed as follows.]

Mr. THOS. WILKIE (Leicester) said that all the various patent controls "left him cold" so far as concerned gas lighting, because he felt that the chances of failure were greater in those mechanical appliances than when they depended on lighting by the human element, which afforded at the same time a daily opportunity of examination. In electric lighting, however, the chances of failure by individual lamps were less likely and there was also the undoubted value of group control, as against unit control. In his own undertaking they were extending electric lighting very rapidly, and were using time switches with great satisfaction. So far as concerned those switches, the speaker felt that Mr. Sharp, in the paper, might well have been a little more generous with his insulating material, which would help considerably. In Leicester they suffered very much from damp and condensation, and they had drilled one or two holes in the box itself to try to keep an even temperature therein.

Mr. LENNOX (Newcastle-on-Tyne), as one who had had very little experience without time switches, but considerable experience with them, said it did seem to him (and it was confirmed by information which he had with regard to installations which had no automatic control) that controlling devices of some kind were very desirable for street lighting, and he felt that after what the members had seen the previous night of the demonstration installation set up in Sheffield they must by now be all convinced of that fact. Mr. Lennox could not see the necessity for the relay system; it was as economical to put in a switch wire of a size to carry a certain number of lamps and to switch on in groups. As regarded underground networks, where new networks were being laid down it was not a very big job to put down an extra network, whereas with existing networks the economical manner was to install a time switch. In group-lamp installations there was a considerable saving in time switches.

Mr. M. H. WARDLE (Liverpool) said that with regard to electric lighting the adoption of time switches had been found very satisfactory: they had saved £1,336 per year in lamplighters' wages, because they had as many as 30 in one group on one switch. Most of that saving, however, up to the present, had been absorbed by maintenance costs, but they were expecting the proportion of maintenance charges to be reduced and that ultimately the saving resulting from time switches would be very considerable. The difficulty was their high cost and it was high time a substantial reduction was made.

The president (Mr. J. F. COLQUHOUN) said in Sheffield they had only had about three years' experience of automatic control, but so far as it had gone their experience was entirely favourable. He feared there had been too great a tendency in the past to put up the controllers and expect them to do their work without attention, whereas obviously the installation of controllers must allow also for definite arrangements to see that they continued to function efficiently. In Sheffield they had nearly 2,000 electric lamps controlled by time switches.

Mr. E. H. HORSTMANN, replying to the discussion, said his objection to electric time switches was their complicated nature, quite apart from the actual clockwork mechanism of the control. He agreed with Mr. Wilkie that if he must have electric lamps, then time switches were good, but even in electric lighting the advantage of unit control over group control was that if one lamp went wrong it was a single failure instead of a group.

Mr. E. E. SHARP, replying on the electrical side, said that since writing the paper he had made inquiries with regard to a relay system in Paris, where they had been experimenting for about three years, and had come to the conclusion that the relays which they had on the posts were not good, and they were now trying a new system. He did not suggest that relays were necessarily the right way of dealing with the situation; much depended on local circumstances. He agreed that the relay did call for at least one extra wire, and it might as well be used for operating a direct switch, but there were circumstances in which relays would be very useful. They could not generally take the place of time switches. Questioners of price probably compared gas controllers (placed inside the lantern without any covering in the form of a cast-iron box) with electric controllers which had to be outside and therefore needed such a box; very often also there was the fitting of fuses. When the two controllers were stripped of the extras necessary for use outside the lamp, there would probably not be a great deal of difference in price.

N.P.L. Tests.

Mr. STILES, of the National Physical Laboratory, gave the meeting an outline of the special midnight test be made in conjunction with members of the Lighting Association of the demonstration lighting installation set up in Sheffield for the benefit of the visiting engineers, and described in the presidential address. The test was carried out at night by Mr. Stiles and members of the staff of the Laboratory, with the aid of some 40 members of the Association, who had volunteered as observers, and aimed at getting accurate results on the spot, and data for use after the Conference to enable conclusions to be drawn from the practical street demonstration to confirm—or otherwise—those obtained in the laboratory. In Test A the observers were asked to appraise the visibility of about 10 installations in an arbitrary scale of numbers from zero to 5. The second part of the test required the observer to find a position at which the glare from the street lamp was at the maximum. Observers were restricted to the centre of the street. Having found the position of maximum glare, the observers were required to judge the exhibit on the basis of the experience of glare at that point. For that particular test the installation which had the most glare was given the highest number and that of least glare the lowest number. Test B was perhaps more elaborate, but no more important, and with the aid of special black disks on stands (with test box centres movable to any direction) it was hoped to collate the net opinion of a large number of expert lighting engineers, a thing quite impossible, of course, in the laboratory. Ultimately, it was hoped, when the final results were got together, to compare the position of maximum glare estimated in Test A with the figures computed in Test B from the figures of Mr. Holliday, in America.

Gas Co.'s Luncheon.

At luncheon, on July 10th, at the Cutlers' Hall, by the invitation of the Sheffield Gas Company, there was a gathering of nearly 250 gentlemen, and Lt.-Col. H. K. Stephenson, D.S.O., I.L.D., D.L., J.P., chairman of directors of the Gas Company, presided.

The BISHOP OF SHEFFIELD toasted "Our Civic Authorities" in a brief and humorous speech.

The Lord Mayor of Sheffield (Ald. M. HUMBERSTONE), replying, said he felt sure the keen competition between the Gas Company and the Electricity Department of the Sheffield Corporation in the matter of street lighting was all to the good of the lighting service, and probably also to the good of the two undertakings themselves, by keeping their methods alert and up-to-date. He doubted whether either would perhaps give such a highly efficient service if there were no competition.

Councillor T. H. HURST (Newcastle-on-Tyne) said that his city, like Sheffield, had experienced a most marked improvement in street lighting since the appointment of a full-time and fully qualified lighting engineer, and that engineer's work had undoubtedly benefited from the fact that he had been one of the earliest members of the Association of Public Lighting Engineers.

Lt.-Col. STEPHENSON, proposing "The Association of Public Lighting Engineers," said that it was young, but strikingly virile, and he warmly congratulated it on having secured licence of incorporation after only five years of existence. Its work was of the utmost value to public safety, comfort and well-being.

Mr. J. F. COLQUHOUN, responding as president of the Association, appealed to public authorities not to consider lighting economy in terms of money solely. There was a steady increase in the importance of effective public lighting as traffic became denser and faster and a tremendous factor of public economy in this aspect. Whatever differences of opinion there might still be as to economy in terms of money, there were no two opinions on the fact that in the past there had been far too great an economy of thought on this matter of lighting and public safety, and it was gratifying to note the steady growth of recognition of this on the part of public authorities.

Works Visits.

The afternoon of July 10th was given over to conducted visits to the famous Sheffield steelworks of Messrs. John Brown and Co., Ltd.; Vickers-Armstrong, Ltd.; and Hadfields, Ltd.; and in the evening the members assembled at 10 p.m. for the general inspection, and special tests of the street lighting demonstration installations referred to above.

(To be continued.)

The Colliery & Mining Exhibition.

A General Account of the Electrical Exhibits.

MODERN electrical mining equipment is the outstanding feature of the Colliery and General Mining Exhibition which is now being held at the City Hall, Manchester (July 10th to 21st), and is being visited officially by members of the following Associations: (1) the Association of Mining Electrical Engineers on July 14th; (2) the Institute of Mining Engineers on July 17th; and (3) the National Association of Colliery Managers on July 21st. Some 90 stands compose the Exhibition, and all manner of gear is on view, from a miner's hand lamp to big plant, including foreign apparatus. Much attention is claimed by flame-proof switches, reference to which appears in the following brief description of the exhibits.

Siemens-Schuckert Gear.

One of the particularly interesting features of the exhibition is the mine-shaft signalling and telephone apparatus of Messrs. Siemens-Schuckert (Great Britain), Ltd., which is operated by 220-volt direct current and serves for communicating signals to the winding-engine house from the onsetters at the pit bottom and bank. A signal must first be transmitted from the pit bottom before the apparatus at the bank can be operated. Signals are both acoustic and optical. The transmitter at the pit bottom is fixed to the wall, whilst that at the bank is incorporated with a signal indicator. Oil contacts are employed for transmitting the signals, and are made extremely robust so as to operate reliably for the necessary thousand times per day. The optical indicators are of simple design, and fixed at both the pit bottom and the bank is a device for communicating in emergency with the winding engine man by means of a hooter. A watertight telephone station operating independently serves for communication between bank and pit bottom; a loud-speaking telephone is situated in the engine house and enables orders to be heard by the engineer even when at some distance from the receiver. One of the most important factors determining the production of a colliery and safeguarding the health and safety of the miner is the efficient lighting of the coal face and haulage roads. Messrs. Siemens-Schuckert have, therefore, evolved electric lighting equipment which provides illumination far exceeding that of electric hand lamps, or flame lamps, and is said be perfectly safe in the presence of firedamp-air mixtures. The lamps employed are of 75 c.p., and are suspended at intervals of from 5 to 10 yards; the power supply for the electrical machinery may be employed for these lamps, a small transformer being installed if necessary. Where compressed air alone is available, a small compressed-air turbine and a generator have been designed for generating the necessary electricity; the whole plant is not costly to install and run, and does not occupy much space. Other safety apparatus is the flame-proof gate-end switch No. H296, which is suitable for protecting cables, transformers, and other electrical equipment used in mines against overload, &c. Special attention has been devoted to making the switchbox flame-proof; the tank must be correctly fitted and locked before any switch can be thrown in. The electrical interlocking device of the tank and the casing is particularly ingenious; the tank can only be removed after the switch has been put into the "off" position. Equal care has been given to the design of the bus-bar boxes, and every part of the switch carrying current is totally enclosed. The three-pole switch is provided with overload and thermal release devices, and where plug connections are made care has been taken that on withdrawing a plug the switch is placed in the "off" position, so that no spark can be produced at the main contact pin of the plug. Two drilling machines are exhibited: the first, a small machine weighing only 28 lb., is a most compact appliance, and is totally enclosed and flame-proof; the flexible cable of the drilling machine is connected to the supply main by means of a special flame-proof interlocking switch, which prevents the cable being disconnected while the switch is in the "on" position. The speed of drilling is so great that a series of shot holes can be drilled in the same time as a single hole is drilled by hand; in coal of medium hardness, a 3-ft. hole can be drilled in about 40 seconds. The second electric drilling machine is more robust, and is employed for drilling in stone and deep shot holes. It is mounted on a stout framework column, on which it can be adjusted at any height required. It also is totally enclosed and flame-proof, and the speed of drilling can be regulated to the type of material that has to be penetrated. The electric motor driving the drill is fixed direct to the latter, and the speed of the drill is from 190 to 280 r.p.m., according to the gearing of the motor. The weight of the machine is about 170 lb. A long flexible cable wound on a drum serves as a connection between the drill and the gate-end switch. Special flame-proof interlocking switches are used for connecting up the cables.

Oldham Exhibits.

The stand of Oldham & Sons, Ltd., storage-battery makers, is one of the most ambitiously conceived in the whole exhibition, and comprises chiefly examples of a modern hewer's lamp which is fitted with a unique form of accumulator known as the snap-lid type, an inherent feature of all Oldham lamps. We were interested to learn that nearly a quarter of a million had been supplied. This is a six-volt illuminant, and the case is a machined aluminium casting accommodating three standard free acid cells, which are held in position by a division plate. The aluminium cover, to which the carrying handle is attached, is made to screw on to the case, forming a flame-tight joint. Incorporated in the bulb holder is an automatic cut-out and safety fuse. The bulb is for 6 volts 0.95 amp., with a maximum candle power of 7.5; the total weight, including accumulators, is 19¼ lb. Messrs. Oldhams also have on view standard charging frames and a series of components of lamps and accessories. An attachment can be supplied to be fixed on the standard unlocking machines for opening lamps fitted with magnetic locks. The Oldham type "H" lamp is of 2-volt 1-c.p. capacity. The light is turned on or off by simply giving a half turn to the lamp bottom, which is securely locked in the ring by a mechanically-operated heavy plunger lock; this lamp weighs 6 lb. The large emergency lamp of from 20 to 30 c.p. is fed from a two-volt, 10-ampere-hour accumulator of unspillable type which is capable of supplying light for nine or ten hours; the bulb of the lamp is of the mushroom lens pattern. This type of lamp is largely used by the mines rescue brigade stations throughout Great Britain. The officials' torch is a more compact lamp, weighing only 3 lb. complete, with a two-volt bulb which gives a concentrated beam of from 25 to 30 c.p. Messrs. Oldham make an excellent display of accumulators, not only for mining lamps, but also for wireless and other purposes. For mining lamps special accessories are available to enable the quick dissembling and assembling of accumulators. The magnetic unlocking machine enables the lamp to be unlocked and the accumulator removed in one operation, the whole weight of the lamp being carried by the table of the machine, and handling the lamp is therefore eliminated. One magnetic unlocking machine should conveniently serve not less than 500 lamps. The lamp-charging frame is made in two sizes: one for 35 and one for 70 accumulators, on seven shelves with heavy phosphor-bronze contacting fingers. As regards the snap-lid removing machine for use with accumulators, experience has proved that to remove the plates, refit with separators and replace the lid in a liquid-tight manner, takes no more than 60 seconds. One of these machines is sufficient for about 1,000 lamps. There is on view even a machine for removing the bulbs from miners' lamps.

Ceag Devices.

Whilst on this subject we may refer to the exhibit of Messrs. Ceag, Ltd., a particular feature of whose stand is a model coal-face which, being in total darkness, enables all the lamps to be tested under conditions almost equal to normal. The lamps are shown in two seams which are made of coal, the room being perfectly black inside. The company manufactures 12 different types of mining lamps and all the main parts are standardised. One of the most interesting is a combined oil-electric gas-detecting lamp which has just emerged from the experimental stage. When it is desired to ignite the oil lamp an extra turn is given to the switch, so causing current to flow along the platinum wires from the two-volt cell to the wick of the spirit lamp, which becomes ignited in from four to five seconds; it can be immediately extinguished and the electric bulb used independently. The oil-electric fitting is shown in attachment with a standard type of lamp, and also in combination with the new inspection lamp. All "Ceag" lamps are fitted with standard two-volt cells, and the large ones have a capacity of 10 amp.-hours, the small ones being of 6 amp.-hours. "Jellac" accumulators are used, they being unspillable and non-leaking. "Jellac" is mixed with the acid before it is poured into the accumulator, and results in the production of a semi-solid jelly electrolyte which cannot spill, leak, or creep. The lid of the accumulator can be removed with speed and certainty by just a twist of the lid which carries with it the electrodes without the removal of a single terminal nut. The circular electrodes are strong and free from buckling. The company is concentrating on a pillarless lamp that does not shed shadows, since it has no protector rods. The candle power is approximately 2.4, against 1.4 c.p. of a standard pillar lamp. The surveyors' lamp, which is also used for signalling purposes, is non-magnetic and sheds red, green, and white light. Another lamp on view has a swivel head. The four-volt lamp carries two two-volt circular accumulators. We were informed that lamps fitted with prismatic lenses are becoming very popular, as they tend to eliminate shadows. Unlocking magnets and charging stands are also included in this extensive display.

Scott & Hodgson Display.

Overspeed and overwind preventers are being demonstrated by Messrs. Scott & Hodgson, Ltd., who necessarily had to confine themselves to the lighter classes of their manufactures. Two turbines are arranged for inspection, one of 50 h.p. and the other of 70 h.p. Turbines are manufactured in sizes ranging from ¼ to 200 h.p., and are employed for driving fans, pumps, or generators; they have been made for working with pressures up to 400 lb. and for exhausting against pressures up to 60 lb. when steam is required for heating or process work. A very interesting device which is to be seen in operation on this stand is a depth indicator and overwind and overspeed preventer for steam and electric colliery winders. Electric winding machines are one of the company's specialities.

(To be continued.)

The Royal Agricultural Show.

Electro-farming Conference and Exhibits at the Royal Show.

NOTTINGHAM, for the third time in the history of the Society, provided an admirable site for the purpose of the Royal Agricultural Show, which was opened on July 10th and continued until the following Saturday, attracting large numbers of visitors from Midland areas and many from distant parts of the country. In respect of its display of electrical appliances and illustrations of electro-farming, the exhibition marked a distinct advance upon those of previous years, the increasing use to which electric power is put and its possibilities of further development being strikingly exemplified. It is estimated that there are now 2,500 British agriculturists who, following the example of the Prince of Wales, have manifested laudable enterprise. His Royal Highness's farm at Lenton, Notts., has been completely equipped with electrical appliances. In view of the changes which have been embodied in the Electricity Commissioners' latest regulations relating to overhead-line construction, it is generally anticipated that the extension of electricity supply to rural areas will be encouraged, and a great impetus will be given to the application of electricity to farm work.

Especial interest attached at this year's show to the milk-irradiation lamps exhibited, the value of ultra-violet rays to lactating cows having been amply demonstrated. The great advantages of the use of electricity in poultry farming have also been illustrated by the valuable results attending the lighting of poultry houses which, it has been shown, has materially added to egg production, by the greater efficiency of electric heating, both for incubators and brooders, and by the undoubted efficacy of electrical treatment in promoting the growth of healthy birds.

But it is in relation to the larger appliances for heavier work on farms that the main value of the use of electric power is seen. In this association of ideas, comparisons to the disadvantage of British methods have been instituted with Continental arrangements, but it may be claimed from evidence of possibilities afforded by appliances exhibited at this year's Royal Show that that disparity is being rapidly overcome, which indicates that, with cheaper means for ploughing, an ordinarily costly factor in agricultural work may be to a considerable extent cheapened. The great variety of uses to which electricity may be put in the garden and the apiary were also illustrated in connection with the show.

It was appropriate that the Nottingham Corporation, whose work is expanding in all directions, should be responsible for one of the chief contributions to the display, its well- arranged stand attracting a large measure of attention. The Nottingham municipality, by the establishment of its great generating station at North Wilford, contiguous to the Trent, on the confines of the municipal boundary, has assumed a large share in the general scheme of East Midlands supply, which is destined to play an important part in national plans, and the display was worthy of its enterprise, the stand containing an excellent assortment of appliances, both for lighting and power purposes, in which, as regarded the former, artistic ideas found adequate exemplification, the display generally reflecting great credit upon Mr. H. Talbot, the city's electrical engineer, and the British Electrical Development Association, by whom it had been jointly devised. "Electricity, the world's servant," was the motto forming a conspicuous feature of the facade of the stand, the value of which, for purposes of effective display, had been enhanced by the laying of a special cable from Wollaton Park to the show ground. The varied appliances of many kinds illustrative of the use of electricity for business and domestic purposes had been admirably selected. Refrigerators of various types were placed on view, and ironers, and were of a character well calculated to elicit the practical interest of those whose domestic labours are designed to be thereby considerably lightened. The means by which tanks become automatically filled when falling below a certain pressure was also demonstrated. Of electrically-operated sheep shearers and horse clippers the show afforded numerous examples, whilst on the dairy side churns and separators of the latest electric type were exhibited. The "Farmer's Boy" was also an appropriately named appliance for driving machines at any spot.

Electro-Farming Conference.

On Wednesday, July 11th, the fourth British Electro-Farming Conference was held in the members' marquee, when an address of an eminently practical character was delivered by Mr. Walter Riggs, the well-known electrical contractor and Suffolk agriculturist, who threw out some valuable suggestions as to how electricity could help the farmer. Mr. H. Bentham, of London, a member of one of the committees of the Association, who presided, observed that considerable attention had been devoted during the past year to rural electrical developments. Mr. Riggs, who had promised to relate the results of his experiences, was a practical farmer, and familiar with the many serious problems with which agriculturists were confronted at the present time. At the end of last year between 1,700 and 1,800 farmers were connected to public electricity supplies in this country, and an additional 500 were to be connected during the first six months of this year. That represented astonishing progress, and pointed to the fact that the subject was indeed a very live one. The greatest deterrent to more rapid progress in the use of electricity for agricultural purposes was the first cost of wiring, apparatus, and motors. This, of course, constituted a serious difficulty for other classes of the community as well as farmers, but it was being gradually overcome by systems of deferred payments, or in some cases deferred payments for wiring and the hiring of apparatus and motors. Another difficulty related to the question of wiring in the case of the farmer who was on a short-term tenancy, as, naturally, he was reluctant to spend capital unless he was likely to reap the full benefit from the outlay. These points and the whole question of rural electricity supply were being considered at the present time by a conference consisting of all parties interested, which had been set up by the Electricity Commissioners, and he was sorry that its report was not available for that meeting.

Mr. WALTER RIGGS observed that during the past 25 years private electrical plant and equipment had been installed upon some of the biggest estates throughout the country, whilst hundreds of farmers had availed themselves of the advantages offered by small mechanical power units, such as petrol or paraffin engines. These installations could be looked upon as stepping stones to the universal application of electro-mechanical power on the farm in the same way as the old isolated power plant in factories and workshops foreshadowed the complete electrical equipment of such establishments when a public electricity supply became available. The time had arrived, if not throughout the country, certainly in many rural districts, when a public supply of electricity was, or shortly would be, available for the use of the farmer. The Central Electricity Board had mapped out the country into areas which would be served by overhead mains and distributors, and it was hoped eventually that no considerable portion of the country would be left without the possibility of obtaining a public electricity supply. It was the intention of the Board that a standard type of current and pressure of supply should be adopted as far as possible. It would be alternating current at 50 periods, 400 volts for power, and 230 volts for lighting. It could be taken, therefore, that any equipment which the farmer purchased for his own use would be of a universal pattern and would always find a ready market with other farm implements. Whilst there was at present considerable variation in the prices charged for electrical energy, he had no doubt that as time went on there would be a more or less standardised charge, which must be economic from the farmer's point of view and from the power generator's and distributor's point of view. He anticipated that most supply undertakings would offer electricity on a two-part tariff. Mr. Riggs gave particulars regarding a farm upon which electricity had been installed, and referred to the advantages attendant upon the electric lighting of farm buildings. The electric range did the work of a coal range, with greatly increased simplicity and cleanliness, and on the farm described there was an electric washing and wringing machine, driven by a small motor, which in an hour would do all the washing that previously took the better part of a day to accomplish.

Dealing with the dairy upon the farm in question, Mr. Riggs said that there was a ½-h.p. motor driving the cream separator, whilst another of similar power was used with worm gearing for operating the churn. In the corner of the dairy there was a sink with an electrically driven bottle-cleaning equipment. Attached to the dairy was a room where the milk was cooled directly it came from the cows; this equipment embraced also an electrically-operated cold-storage cabinet, where butter, dressed fowls, and other perishable food could be kept at a uniformly low temperature until it was required. A ½-h.p. motor gave all the power that was required for this equipment, which was automatic in action and kept a constant temperature in the cold chamber, besides providing a certain quantity of ice. With a cold chamber of sufficient capacity, only one journey to the railway station per day need be made, which alone constituted a very great saving in

transport costs. Next door were the cowhouses, where the milking machines were of great assistance. In the yard of the farm the water was pumped up into a tank by a 1-h.p. motor, and, this being automatically operated from a float-switch in the tank, a constant supply without manual labour was assured. In the workshops, where repairs were carried out to implements, gates, &c., as required, a 3-h.p. motor was installed, which drove either direct on to a circular saw, or on to countershafting as required. The incubators and foster-mothers in the poultry houses were all electrically heated, the heat being controlled by a thermostat, so that a constant temperature was maintained. The fowl houses were electrically lighted, so that in winter, by means of a time switch, the light was switched on two hours before sunrise, encouraging the fowls to start feeding earlier than would otherwise be the case, with the practical certainty of more eggs resulting. A visit to the barn revealed different machines, each driven by a separate motor. There was also in use an electric shearing machine standing in a clean dry place. Mr. Riggs also described silo operations in progress on the farm, and pointed out that the motor used for driving the ensilage-cutter was also employed for driving the drum for threshing. A very great need existed for suitable machinery to deal with hay and corn crops in counties that suffered from a great deal of rain during the harvest season. Experiments in this direction had been carried out in several places and he had no doubt that a thoroughly sound commercial and economical method would very soon be evolved to deal with damp crops. In relation to the questions of availability and cost, Mr. Riggs observed that electrical progress in rural districts had been held up for months at a time owing to the difficulty of obtaining the necessary way-leaves from the various interested bodies and individual land-lords. When the supply authority's engineer asked for permission to put poles across a meadow, alongside a hedge, or in some other necessary location, obstacles should not be placed in the way. Every extra 100 yards of overhead wire cost, as regarded interest and sinking fund, had to be paid for by the consumer in the long run, in the price of the unit of electrical energy. He suggested, therefore, that they should do all they possibly could to help supply authorities in erecting direct transmission lines, both for themselves and their neighbours, and in avoiding devious and circuitous routes. It was preferable to have the company's meters and switchgear in a lock-up chamber. This was where the work of the supply company really finished. At that point an electrical contractor was called in to install the wiring, apparatus and motors. The wiring and installation, if carried out in one of the well-known metal-sheathed systems, could be done for lighting somewhere in the neighbourhood of 25s. a point, on an average, while the motor leads might cost anything from 25s. upwards, depending upon the length of runs and size of motors. The question of financing an installation and the purchase of motors and apparatus was one that very often prevented the farmer from taking advantage of the use of electricity, however much he might like to do so. It seemed to him (Mr. Riggs) that the agricultural credits of which they had been hearing quite a lot recently should be of some assistance to the farmer in this direction. But, if these could not be applied for that purpose, there would be no difficulty in the farmer obtaining all his requirements on the hire-purchase system.

As to the size of motor to be employed, Mr. Riggs observed that as the energy consumed was practically in proportion to the actual work done, it was not necessary to keep the size of the motor closely down to suit the work to be done. On the contrary, in selecting a motor, it was desirable to have a reasonable margin of power. The very small motors cost more per h.p. than the larger sizes. For instance a 1-h.p. motor running at 1,400 r.p.m. cost about £12 10s., including starter and pulley, while a 5-h.p. motor of the same speed only cost about £21. The same motors, running at half the speed, would cost, respectively, £16 for the 1-h.p. and £23 for the 5-h.p. A motor of 10 h.p., running at 1,400 revolutions, complete with starter, would cost £28, while the same motor at 700 revolutions would cost about £42. He had been furnished with some interesting figures from the chief engineer of a northern corporation, which, out of the total number of farms which could be served by its low-pressure lines, had over 60 per cent. connected. Out of a total of 54 farms, 26 had farm machinery electrically driven, lighting in the buildings and domestic appliances in the house; the average cost for lighting and power worked out at 3.34d. per unit. Of 28 farms which had so far only gone in for lighting and some cooking and heating appliances, the average cost worked out at 5.32d. per unit. The same engineer had informed him that farms of fewer than 100 acres had electrical installations varying in cost from £13 to £97, whose electricity bills varied from £3 5s. per annum for the smaller installation, to £26 10s. for the larger. Farms of from 100 to 200 acres had installations varying in cost from £60 to £320; their electricity bills varied from £12 to £129. The general idea in arranging tariffs was to encourage the use of electricity for all purposes. The general solution of the tariff question would no doubt be a fixed charge, based upon some such facts as cost of service line, acreage of farm, assessment value of farm, or perhaps kilowatt or horse power equivalents connected, plus a unit charge perhaps of 1½d. for electricity used for all purposes, including lighting. This would follow closely upon the lines upon which the Post Office charged for its telephone service. There was a recommendation before the authorities concerned at the present time for the general adoption of a two-part tariff, and he thought they might take it for granted that it would be shortly available in most areas. In that case the annual quarterly payment for the service having been made, it would become very easy for the farmer to estimate his own running costs on the basis of one actual h.p., costing about 1½d. per hour, whilst 1½d. so far as lighting was concerned would cover the cost of running a 20-c.p. lamp for 50 hours. It was only a matter of arithmetic for the farmer to arrive at what his approximate cost would be, always bearing in mind that with electricity there was no waste, as the light, heat, or power could be switched on when required and switched off when finished with. As to the advantage of the electric motor over the oil engine, it should be remembered that in considering costs a comparison between the cost of electrical energy and the fuel oil used per hour per h.p. was very misleading. A motor had as a rule only two bearings to keep oiled, and as these were generally ball bearings, this attention was only very occasionally required. An engine, on the other hand, was made up of a large number of wearing parts that all needed attention daily, thereby occupying a man's time, not to speak of the cost of the lubricating oil. The space occupied by a motor against that required for an engine of equal power, with adequate oil storage and tank space, must also be taken into consideration. Every farmer was painfully aware of the time lost while a man started up an engine on a cold winter's morning, keeping several other men waiting about. An electric motor, on the other hand, could be started by a child. With an engine in use a little job that could be done in half-an-hour before knocking-off time was left until the next day on account of the trouble of starting, while, if a motor had been installed, it could have been done overnight. The constant speed of a motor was also a great factor in efficiency, especially in threshing, whilst the cost of maintenance and renewals of moving parts was all against the engine. Some farmers now employed several small petrol engines in place of one larger one to ensure a margin of safety in the case of the breakdown of one; the portable electric motor, however, represented a much more simple and handy proposition.

The CHAIRMAN expressed appreciation of the eminently practical character of Mr. Riggs's address, adding that the Association was not yet prepared to put forward any definite proposals regarding electro-agriculture, until it was satisfied that the apparatus which would be used represented a commercial proposition. They did not think that the present ploughing appliances were a commercial proposition. If the necessary load could be obtained for ploughing, a very useful result might be effected in rural districts, but it must be done at the lowest cost.

Sir ERNEST PETTERS (Yeovil) said that he had had an opportunity of going over the farm in Sussex and seeing the machines which had been referred to by Mr. Riggs, and he was highly pleased with the work which he saw going on there. There was no doubt that they were at the parting of the ways with regard to the use of power on the land for farming purposes, and great developments were in store.

Mr. E. A. MITCHELL, M.I.E.E., of Cuckfield, Sussex, to whom the Chairman referred as having undertaken experiments with regard to electric ploughing such as were calculated to go very far towards solving the problems under consideration, said that he had confined his attention to ploughing because he thought that unless they got the arable load they would have difficulty in dealing satisfactorily with the commercial side of the matter. It had been estimated that there would be a saving of a million a year in connection with the S.E. England scheme by the application of electricity to arable land. Electrical ploughing was at present in its infancy, but of its progress there could be no doubt.

Mr. W. F. FURSE (Nottingham) congratulated Mr. Riggs on his paper, and inquired whether he had experienced any trouble in relation to single-phase supply.

Mr. J. C. NEWMAN, of the Institute of Agricultural Engineering, Oxford, observed that they could not have electricity in the country at the price at which they had it in the towns. He had had some experience with regard to wayleaves, which had been referred to by Mr. Riggs. Those who wanted to run wires across his land offered him a shilling per pole, and he was hurt, thinking that the amount was not enough; but he thought that if they got a shilling per pole per hundred yards it might meet the difficulty.

Mr. R. BORLASE MATTHEWS (East Grinstead) said there had been an enormous increase in respect of the number of farmers using electricity, the total having risen from 200 to 2,500. Of that number approximately 500 were utilising oil engines for its production. Probably it would pay a farmer with a holding of 150 acres to put down dynamos and so ensure himself a continuous supply. He suggested that it would be to the advantage of agriculturists that they should support the work of the British Electrical Development Association. It had been said that progress in the matter of the application of electricity to farming purposes had not been hitherto great. That might be so as far as England and Scotland were concerned, but if they looked across the Channel they would find that great advances had been made in relation to the matter in France.

(To be continued.)

Correspondence.

Correspondents should forward their communications **as early as possible.** *No letter can be published unless we have the writer's name and address in our possession.*

Domestic Lighting and Heating and their Influence on Load Factor.

I have read with interest this discussion (page 1158), and from experience I can say there is unfortunately much truth in Miss Haslett's remark that women are afraid of electricity, and the aspect to which these lines are devoted as a rule does not receive its full meed of consideration.

One hears a great deal about electricity in the home, but how often anything about electrical education in the home? The latter is in my opinion a *sine qua non* to the former; and the lack of this education to my mind is a real stumbling-block to the displacement of noxious fumes from our homes. Electricity supply authorities who demonstrate the uses of electricity for domestic purposes might very profitably include in their demonstrations some useful advice and hints on the subject of abuse of electrical appliances.

I have in mind a case of recent occurrence where the flexible of a vacuum cleaner in course of time became frayed at the point where it enters the plug, and the user, without mentioning the fault to anyone, continued to work the machine, even after the wires had become severed, by means of "propping up" the broken portion so that the wires met to enable the current to flow and the machine to be used in this precarious state. The result was the inevitable short-circuiting and destruction of the armature. At the time of writing these lines there is a case reported in the newspapers of a death alleged to be caused by the use of a vacuum cleaner, which was probably the outcome of misuse or neglect.

Another fruitful source of trouble is that the uninitiated will often, when putting away an electric iron or toaster after use, double up the flex as one would a piece of string or rope, with the natural result. When trouble does come in this way it usually puts fear and trembling into the user, and it is no uncommon thing to hear such remarks as "gas never goes wrong," and the impression gets abroad that electricity is dangerous.

If people who use these appliances could receive instruction and general advice in their use this fear would be dispelled, to the benefit of all concerned. I venture to suggest that manufacturers might with advantage attach a tag to small portable articles such as kettles, irons, toasters, &c., giving advice and warning users against working the article after a fault has developed in the wiring or in the article itself.

Another way in which electricity suppliers might educate consumers and consequently increase their output would be by lectures in conjunction with their cookery demonstrations on the use of domestic electricity, the current consumption of various appliances, and the replacement of small fuses. I know of several cases where people, who know nothing about electricity, when it is explained to them what a certain size electric fire or other appliance will consume and how much it will cost to run, are usually incredulous and dismiss the subject with some such remark as: "Yes, it's like gas fires; have them installed and up goes your bill."

The point of these lines is that it is of little use to sell an electrical article unless the user is given instruction in its use, for when trouble comes through misuse or neglect it engenders fear, and this state of mind can only mean the very reverse of benefit to the industry.

E. J. Rutland.

London, *July 12th*, 1928.

Earthing and the Public.

I was greatly interested in the article, "Earthing as a Safeguard to the Public," in the REVIEW of July 13th, page 78. I enclose for your inspection a cutting from the *Daily Mail* of July 14th, illustrating "a case in 10,000" where a lady lost her life due to touching a gas stove and a live vacuum cleaner at the same instant. At the inquest it was stated that this would not have happened if the handle of the cleaner had been well insulated. Now my contention is that a piece of apparatus should either be absolutely insulated or *earthed*, and preferably the latter. Had this machine been earthed the fuse would have cleared the fault at the instant of closing the switch, whereby a shock would have been avoided, or would have been of such short duration as to make no matter at this pressure. An insulated handle is useless if other parts are open or live. When is a regulation going to be passed enforcing all apparatus to be earthed and forbidding the use of lampholder attachments for other gear than lamps? I am certain it is the lampholder with its wood or ebonite plug which is causing these domestic accidents. The 3-pin plug is the only cure, but unfortunately its price is still high. When are the contractors going to realise that every "fatality" leaves a wake of sceptical householders?

Noel S. Byers.

Manchester, *July 16th*, 1928.

[Here again is the demand for compulsion—utterly impracticable. What regulation or prohibition can possibly prevent a householder from plugging into a lampholder? How many kitchen boilers are fitted with safety-valves? An occasional fatal accident with electricity, even where every precaution is taken in the first instance, is inevitable, just as an occasional gas explosion is inevitable.—EDS. ELEC. REV.]

With reference to your well-balanced leaderette, "Earthing and the Public," which happens to be published at the same time as the daily Press is much concerned with the regrettable fatality caused by a defective vacuum-cleaner switch, it is without a doubt impossible wholly to guard against such accidents even though earthing devices were in daily use, as these in their turn are liable to become defective.

There is no doubt that the ordinary electrical installation properly installed in the average house of to-day is 99.9 per cent. safe, and no useful purpose is served by adding to the complication of domestic apparatus by earthing devices.

We should in every possible way impress on the domestic user of electricity that electrical appliances are at least as safe as gas. Undoubtedly the fatality already referred to will make some people nervous, and this is all to the bad, as public confidence in the use and safety of electrical appliances will do much to assist in popularising their use and in helping forward the country to that electrical age which is our aim and ambition.

F. Goble.

London, *July 16th*, 1928.

Small Circuit Breakers.

It is indeed time these were adopted for distribution circuits, whether for lamps, irons, heaters, or motors. The unreliability of all low-pressure fuses when replaced, and even when new, with the exception perhaps of the gauged insert cartridge pattern, for which a stock of rather expensive items must be held, is a menace to the reputation of electricity as the safest medium for domestic light, heat, and power.

For nearly ten years I have used and recommended small circuit breakers, and it is therefore not surprising that I have at the moment before me a descriptive list of Elimafuse Universal Safety (U.S.) circuit breakers ranging from 2 to 25 amperes, fitted with thermal or with temporary overload (for direct-connected motor starting) control issued by yet another firm, namely, Industry and Commerce Alliance, Ltd., who claim that 500,000 small circuit breakers of their pattern are already installed.

There is evidently a ripe market and an "urge" to supply it, and may the best pattern receive the support of all who have an interest in electrical development.

Justus Eck.

London, *July 16th*, 1928.

Installation Costs.

With reference to Messrs. Mortimer & Gall's complaint in your issue of July 13th, the people who cut them out evidently worked either for nothing, or with boy or spare-time labour.

Working on a job with h.g.s. welded tubing, with screwed fittings, *i.e.*, switch, ceiling rose, elbows, tees, &c., with an average length per point of 24 ft., using 40 ft. of 3/.029 v.i.r., 600-megohm "Nonazo" per point, the complete job, with the exception of lamps, could be worked out as follows:—

Material, per point, other than main switch and dis. board and lamps, 15s. 5½d.; on a 30-point job=15s. 5½d.×30=£23 3s. 9d.; m.s. and 6-way dis. board, £1 17s. 6d. *Labour*, say, 100 man-hours at 1s. 6d., £7 10s.; insurance and postage, 3s. 6d.; total for 30 points, £32 14s. 9d.

Thus the cost works out at approximately £1 1s. 10d. per point on a 30-point job; this is pretty fine cutting considering that the job will carry its guarantee; then there is a 'bus or car allowance, overhead expenses, carriage of material, and all those "little drops of water" which have a habit of mounting up, and wear and tear of tools, &c.

Possibly, and I think this is the likeliest solution: the contract complained of was carried out by spare-time men, or non-*bona-fide* contractors, who, unfortunately, can obtain supplies from many firms "over the counter" (so long as they have the ready money it is as easy as kissing your hand), and some of these are firms of repute, too.

The least that can appear is that the firm or individual in question is (1) not dependent on their (or his) contracts for a livelihood, or (2) have very low (if any) establishment charges.

In any case, why not bring a rule into force whereby "all electrical installations (excluding such places as chemical works, breweries, and the like where acid fumes are existent) shall be guaranteed against defect for a period of five years?

Any good screwed tube job will last three times that period as a rule, and if it was fitted with 2,500-megohm Association cable, it could be taken out at the end of that time and used again with safety. Yet the comparison of cost is only 14s. per 1,000 yards, less than 0.2d. per yard—this for 3/.029 v.i.r.

The contractor would have nothing to lose, as, if anything goes wrong with an installation now, more likely than not the postman, or some other casual caller, "fixes it" for them.

Further to this there are public bodies (councils, &c.) in the North of England who *let* their contracts to colliery elec-

tricians and such, who carry out the work in their spare time, at nights and week-ends, in spite of having qualified and registered contractors in the same ratable area.

These people, of course, have a *bona-fide* contractor "beaten to a frazzle," as they are usually to be found living in houses rent free. Is it any wonder, then, that the price has to be cut to compete with them?

Why cannot the Ministry of Health, through the Public Works Loan Board, make it a condition that such loans as are made to councils, hospitals, &c., must be spent legitimately, and no person employed *to do work*, if that person is already employed, much less let contracts to them?

Probably some fellow reader can tell us, through your columns, if it is legal to let a contract to persons such as the above.

I think Messrs. Mortimer and Gall will find their trouble due to some instance similar to the foregoing conditions, wholly or in part.

W. H. Crowe.

Willington, Durham, *July 16th*, 1928.

House-wiring Specifications.

I was very interested in Mr. Taunton's article on "Undercutting," and I would like to make a few suggestions for remedying the evil—at least as regards one particular class of property, Council houses and small property generally. My own view is that quoting per point is not fair either to the owners or to the contractor; each house must be taken on its merits or demerits (as in council houses mostly). The greatest difficulty the contractor is up against is the so-called specification, drawn up probably by the office boy and sent out by the local authority; "loose" is not the word for it, and with a view to getting over the difficulty I suggest the following:—

COUNCIL HOUSES AT ————.
9 lights in each as per schedule.
ALL MATERIALS TO BE OF BRITISH MANUFACTURE.

Cables: 3/029 throughout, cabtire, fixed with buckle clips, run under floors through holes drilled in joists and on surface of walls when finished, or inside lath and plaster partitions. Junction boxes to be used.
Switches: All switches to be shockproof, and sample to be submitted.
Holders: All holders to be of MV make with patent cord grip, or similar; sample to be submitted.
Flexible: 23/36 best quality vulcanised; sample to be submitted.
Main switch: To be of ironclad type with two pairs of fuses, thus doing away with dis. board.
White enamelled blocks ½ in. by 3½ in. to be used throughout.
All fittings will be pendants consisting of ceiling rose, flex, holder, and opal shade.

Such a specification as this can be followed by anyone, and having samples submitted, the authority concerned can see what is quoted for and can see that it gets it without technical knowledge. Further, where electricity is available there will always be an engineer of the supply undertaking who will willingly advise an authority which is the best tender to accept.

Now that excellent shockproof switches are available, it seems to me that they should be made compulsory everywhere; 200 volts direct-current shock is nothing compared with a.c., and as the latter will be the general thing, every step possible should be taken to guard against shock. While on this question of shock I should like to say a word to the makers of domestic apparatus: "Don't rely too much on the frame of the apparatus being earthed."

With such an installation as that suggested above in small houses there is nothing except the main switch to earth, rather must manufacturers resort to the use of earthenware and other insulators so as to render shocks almost impossible. I do not know whether the Bakelite lampholders now on the market are being found satisfactory after prolonged use, but if they are they should be made compulsory on all open pendants. Another thing which would greatly increase the safety of installations is the absolute prohibition of the 14/36 rubbishy foreign flexible cord. I was recently in a beautiful old 14th-century inn where they had electric light, and the flexible was black and red wireless stuff stapled to the old beams, and running all over the place—a wicked sight.

Old Hand.

July 10th, 1928.

Past and Present Conditions of Jointing.

Noting the agitation in the daily Press about the high price of electricity per unit, also the complaints about the price of connecting up consumers, I think a few notes as to labour conditions should be in order.

A strong request has been put forward to the employers by the Communist section of the jointing industry for 2s. 6d. per hour for plumber-jointers, jointers, and their mates *pro rata*; no such ridiculous amount was ever thought of before, and in the present state of labour it is out of all proportion to the pay of other sections of the industry, and is, no doubt, making the employers wonder if we jointers are in our right minds to be led by such people.

The most that could be thought of was some consideration for working on live mains in inclement weather, and under unhealthy conditions, &c. But in some undertakings that are run, managed, and dominated by Socialistic vote, and, consequently, empowered to pay away ratepayers' money, plumber-jointers are on a bonus of from 7s. to 10s. per week, bringing the money up to 2s. per hour, so, perhaps, from their point of view, the jump is not so much as it seems. Fancy a jointer's mate sitting on top of a hole rolling tapes at about 2s. per hour, and skilled fitters, turns, and other mechanics looking for work (which they cannot get) at 1s. 6d.; or see advertisements in the technical papers for electrical engineers, A.M.I.E.E. and B.Sc. qualifications, &c., at about £3 per week—in fairness to the moderate trade-union leaders, they are not very keen on it.

I noted in the "Correspondence" columns of the ELECTRICAL REVIEW of December 30th, 1927, a complaint by Mortimer and Gall (presumably electrical contractors) about the price quoted by the Supply Co. to connect two prospective consumers, *viz.*, £3 and £4 10s. This can easily be accounted for. I have, myself, worked on several undertakings of various degrees and hues of Unionism where one twin service connection was the day's work with a navvy to assist (a job we did before breakfast in the olden days); two only were done with considerable overtime, any improvement on this meeting with very marked disapproval from the stewards of whatever brand of Unionism might be in force in that locality. Therefore, Mortimer & Gall's £3 is soon accounted for:—

Jointer	... ...	8½ hours @ 1/11	= 16/3½
Jointer's mate	... ...	8½ hours @ 1/5	= 12/0½
Navvy	... ...	8½ hours @ 1/4	= 11/4
Meter fixer	... ...	2 hours @ 1/6	= 3/-
Meter fixer's mate	...	2 hours @ 1/3	= 2/6

Plus permanent reinstatement and installation inspector. Contrast this with the old country job—any service under 3 yards, mate to get out ground, and two connections a day. This is, of course, with the contractors. I only mention service work, but similar ca' canny rules apply in all classes of mains and distribution work where these people are in the majority and there are many ways of making a progressive worker very uncomfortable.

Plumber-Jointer.

Output, Load Factor and Efficiency.

In a leading article in the ELECTRICAL REVIEW of August 13th, 1920, the question of the effect of load factor upon efficiency was dealt with at some length, and it was very clearly shown that if the "Parsons Law" is true, the coal consumption of the station is unaffected by load factor.

An example was given of a Canadian station, the law for which was:—

$$C = 20{,}000 + 2.917\,K,$$

where C is the total coal burned per eight-hour shift expressed in lb. and K is the total energy generated during the same period, and it was shown that for equal output the coal consumption would remain the same, whether the output was obtained on a load-factor of 50 per cent., or on one of 100 per cent.

Perhaps Mr. Purse has overlooked this fact in his interesting article.

Accountant.

July 16th, 1928.

The L.C.C. Tramways.

Report for 1927-28.

THE Highways Committee recently submitted to the London County Council its report on the working of the tramways for the year ended March 31st last. The total income amounted to £4,333,783, as compared with £4,155,547 in the preceding year, and working expenses were £3,810,826, as against £3,954,946, leaving a gross profit of £522,958 (£200,290). After meeting capital charges, including £785,091 for debt interest and redemption, there was a net deficiency of £226,210. The corresponding deficiency for 1926-27 was £275,159, but the Committee points out that in comparing the figures for the two years, two important points should be borne in mind. The deficiency of £275,159 for 1926-27 was estimated to be some £226,000 higher than it would have been but for the loss during the period of the general strike in May, 1926, and the additional expenditure on fuel due to the prolonged stoppage in the coal industry. No similar labour disturbances occurred to affect the results for 1927-28, but the accounts of that year had to resume an annual liability, roughly computed at £300,000, for certain debt charges, of which the accounts of the three previous years had been relieved. In consequence, the charges for interest on, and repayment of, debt during 1927-28, which otherwise would have been rather less than in the previous year, were actually £251,678 greater. The passenger traffic receipts increased from £3,993,601 to £4,185,550, with a consequent increase in the average receipts per car mile from 14.28d. to 14.37d., while the working expenses per car mile fell from 13.69d. to 12.70d.

The total net capital expenditure on the undertaking up to March 31st last was £17,178,561, of which £163,349 represents expenditure during the year. The amount of debt incurred up to that period was £17,569,636, and the net debt outstanding, after allowing for debt repaid, sinking fund balances, and for £124,614 in respect of the value of surplus property, was £8,692,987. The amount of capital expenditure which, up to March 31st last, had become obsolete owing to the electrification of the horse tramways was £2,024,688, but the debt in respect of this expenditure had been reduced to £687,185 by the process of repayment and by proceeds of sales. Certain expenditure amounting to £601,735, incurred in connection with electric traction, had also been rendered obsolete. The debt outstanding in respect of capital expenditure on obsolete electric traction amounts to £90,484.

The sum paid to Metropolitan Borough Councils and the City Corporation for rates on the permanent-way amounted to £30,681. This amount is in addition to rates (£82,282) paid by the Council in respect of tramway offices, power station, car-sheds, sub-stations, depôts, &c. The saving to the road authorities in consequence of the obligation of the Council to maintain the paving along the tramway routes was estimated at the end of the year under review to be about £33,500 a year on the present mileage. The amount charged up to the end of the year to the tramway capital account in respect of the cost of effecting street improvements along tramway routes, under resolutions already passed by the Council, was £752,607.

The length of route operated at March 31st last was 165.72 miles. The car miles run increased from 67,113,143 to 69,890,518, and the number of passengers carried from 667,103 489 to 705,762,261.

During the year a further portion of the authorised tramway from Southend Village to Grove Park Station was opened, namely, from Valeswood Road to Southover, Downham.

Published Specifications.

Compiled expressly for this journal by a firm of Chartered Patent Agents. The numbers in parentheses are those under which the specifications will be printed and abridged and all subsequent proceedings taken.

1926.

32,466. "Stereoscopic pictures." Television, Ltd., and J. L. Baird. December 22nd, 1926. (292,365.)

1927.

2,327. "Transmission of signals for television and like purposes." Television, Ltd., and J. L. Baird. January 26th, 1927. (292,632.)

4,173. "Cooling systems of enclosed electric motors and other dynamo-electric machines." Enclosed Motor Co., Ltd., and P. A. H. Mossay. February 15th, 1927. (292,634.)

4,947. "Electropneumatic machines for the recording and checking of statistics and the like." P. Trojani and C. D. Ascanio. February 22nd, 1927. (Addition to 253,134.) (292,639.)

6,569. "Electric burglar alarms." H. J. Tibbles and Rely-A-Bell Burglar and Fire Alarm Co., Ltd. March 9th, 1927. (292,649.)

7,565. "Means for electrically transmitting imagery." F. M. Robb. March 18th, 1927. (292,659.)

7,655. "Vacuum electric-tube devices." E. Y. Robinson and Metropolitan-Vickers Electrical Co., Ltd. March 19th, 1927. (292,664.)

7,723. "Direct production of homogeneous rubber goods from rubber dispersions by electrical means." Anode Rubber Co., Ltd. (in liquidation). April 15th, 1926. (269,504.)

7,771. "Telephone systems." Associated Telephone and Telegraph Co. April 8th, 1926. (269,152.)

7,794. "Electric switches." H. J. Norballe. March 21st, 1927. (292,670.)

7,836. "Electrical discharge tubes." J. H. T. Roberts. March 22nd, 1927. (292,671.)

7,907. "Lamps for motor vehicles." E. A. Jeanotte. March 22nd, 1927. (292,674.)

7,923. "Shock-absorbing mats for use with telephones, loud-speakers, and the like." Redfern's Rubber Works, Ltd., R. H. Blackmore, and G. Lever. March 22nd, 1927. (292,676.)

8,010. "Oil-immersed electric switchgear." A. Reyrolle & Co., Ltd., A. Allan and H. W. Clothier. March 23rd, 1927. (292,679.)

8,069. "Electric battery containers, such as electric lamps." Ever-Ready Co. (Great Britain), Ltd., and F. S. Johnson. March 23rd, 1927. (292,687.)

8,126. "Insulator couplings and chains of insulators." Bullers, Ltd., and P. Rock. March 24th, 1927. (292,689.)

8,265. "Telephone systems." Automatic Telephone Manufacturing Co., Ltd., and J. E. Ostline. March 25th, 1927. (292,691.)

8,643. "Electrical resistances." F. P. Burch, J. A. Dorrat, and Metropolitan-Vickers Electrical Co., Ltd. March 29th, 1927. (292,707.)

8,832. "Electric fuses and the manufacture thereof." Simplex Conduits, Ltd., and H. F. McLoughlin. March 31st, 1927. (292,710.)

9,021. "Process for the manufacture of cathodes for discharge devices." Allgemeine Electricitäts-Ges. April 1st, 1926. (268,815.)

9,203. "Translating devices and amplifiers for periodic variations of electric potential." W. J. Brown and Metropolitan-Vickers Electrical Co., Ltd. April 4th, 1927. (292,716.)

9,830. "Miners' safety lamps." D. Lewis. April 9th, 1927. (292,725.)

10,059. "Plug adaptors and like electrical fittings and cord grips therefor." A. Bonnella and Bonnella Bros., Ltd. April 12th, 1927. (292,727.)

10,799. "Protection devices for motor-generator sets." English Electric Co., Ltd., R. A. R. Bolton, and F. G. Ford. April 22nd, 1927. (292,733.)

12,017. "Electrodynamic magnet system for microphones, loud-speakers, or similar devices." S. G. S. Dicker (Naamloore Vennootschap Philips' Gloeilampenfabrieken). May 5th, 1927. (292,739.)

12,929. "Production of coiled filamentary bodies." A. S. Cachemaille (Westinghouse Lamp Co.). May 13th, 1927. (292,743.)

14,001. "Plug sockets used in connection with electric couplings." J. B. Tucker. May 25th, 1927. (292,752.)

14,142. "Electric immersion heaters." F. C. Knight and H. J. Cox. May 26th, 1927. (292,753.)

15,042. "Automatically-oscillating electric fan." Veritys, Ltd., and J. F. Lisser. June 7th, 1927. (292,761.)

15,466. "Differential of Wheatstone-bridge circuit arrangements." A. Rio and L. Levy. June 15th, 1926. (272,899.)

15,932. "Trailing electric cable." C. J. Beaver and W. T. Glover and Co., Ltd. (Cognate application, 32,943/27.) June 15th, 1927. (292,769.)

17,028. "Protective cases for electrical resistance thermometers and mountings therefor." Siemens Bros. & Co., Ltd., and L. G. Salmon. June 27th, 1927. (292,773.)

18,865. "Electric resistances." W. F. Jones. July 16th, 1927. (292,787.)

19,283. "Manufacture of commutator brushes." Metals Disintegrating Co., Inc. July 20th, 1926. (274,879.)

21,022. "Mining lamps." G. Schauly. August 10th, 1926. (275,990.)

22,772. "Electric time switches." Landis & Gyr Soc. Anon. September 8th, 1926. (277,319.)

27,689. "Manufacture of electric incandescent lamps." Gral Ges. für Elektro-Industrie. November 9th, 1926. (Addition to 261,398.) (280,515.)

27,900. "Direct production of homogenous rubber goods from rubber dispersions by electrical means." Anode Rubber Co., Ltd. (in liquidation). April 15th, 1926. (Divided application on 269,504.) (279,474.)

28,392. "Electrolytic extraction of aluminium." Aluminium-Industrie Akt.-Ges. November 22nd, 1926. (280,881.)

28,973. "Coin-freed telephone apparatus." C. A. Cambay. November 4th, 1926. (280,200.)

29,788. "Driving gear for electrically-driven locomotives." J. Buchli. November 7th, 1927. (Addition to 273,507.) (292,833.)

29,834. "Trellis mast for live-wire suspension, the foot of which is directly placed in the ground." Brown, Boveri et Cie. Akt-Ges. July 13th, 1927. (292,834.)

29,942. "Portable electric lamps." B. Rogge. November 8th, 1927. (292,836.)

31,255. "Tell-tales used in connection with the electric rear lights of power-driven vehicles." O. Murbach. November 21st, 1927. (292,841.)

31,538. "Process and means for synchronising transmitting and receiving apparatus for use in picture and the like telegraph systems." Telefunken Ges. für Drahtlose Telegraphie. November 24th, 1926. (281,302.)

33,054. "Combined electrical couplings and switches of the lampholder type." J. A. Crabtree. December 7th, 1927. (292,848.)

33,055. "Electrical adaptors of the multiple socket type." J. A. Crabtree and B. G. Harrison. December 7th, 1927. (292,849.)

33,843. "Horizontal double-cap insulators for high-tension electric cables." F. Berg. December 14th, 1927. (292,854.)

34,150. "Electric system of selective distant-control apparatus." Compagnie pour la Fabrication des Compteurs et Matériel d'Usines à Gaz. December 30th, 1926. (282,745.)

34,396. "Automatic devices for filling storage batteries." J. L. M. Frejacques. January 10th, 1927. (283,478.)

35,207. "Automatic reclosing circuit-breaker systems." British Thomson-Houston Co., Ltd. December 30th, 1926. (282,811.)

1928.

31. "Loud-speaker." Hopkins Corporation. January 7th, 1927. (283,210.)

32. "Loud-speaker." Hopkins Corporation. January 7th, 1927. (283,211.)

34. "Loud-speaker." Hopkins Corporation. January 7th, 1927. (283,212.)

1,141. "Illuminating and signalling appliances." Holophane, Ltd. (Soc. Anon. Française Holophane). January 12th, 1928. (292,867.)

1,727. "Picture telegraph apparatus." Telefunken Ges. für Drahtlose Telegraphie and Dr. A. Karolus. February 11th, 1927. (285,072.)

3,077. "Transmission of signals to railway vehicles." Siemens & Halske Akt.-Ges. March 18th, 1927. (287,157.)

3,824. "Insulator link connectors and protectors." F. H. Reagan. February 16th, 1927. (285,428.)

3,877. "Device for coupling an electric motor with a machine rotating at a great speed." J. Rozieres. February 7th, 1928. (292,875.)

4,251. "Photo-electric apparatus and circuits therefor." Telefunken Ges. für Drahtlose Telegraphie. March 26th, 1927. (287,844.)

6,228. "Picture and the like facsimile telegraph apparatus." Telefunken Ges. für Drahtlose Telegraphie. April 7th, 1927. (288,251.)

7,383. "Control of electric power and apparatus therefor." British Thomson-Houston Co., Ltd. March 9th, 1927. (286,703.)

8,215. "Electrical terminal connections to electrically conducting surfaces." Metropolitan-Vickers Electrical Co., Ltd. April 2nd, 1927. (288,174.)

8,326. "Electric oscillation generators." British Thomson-Houston Co., Ltd. March 18th, 1927. (287,466.)

8,955. "Thermionic valve arrangements." Telefunken Ges für Drahtlose Telegraphie. March 29th, 1927. (287,903.)

10,019. "Pressure-relief pipes for electrical apparatus casings." British Thomson-Houston Co., Ltd. April 4th, 1927. (288,209.)

12,155. "Device for maintaining constant the tension of overhead conductors for electric railways." R. Iten. May 2nd, 1927. (289,805.)

13,431. "Reproducer units adapted to be actuated by a gramophone record for producing electrical impulses." Igranic Electric Co., Ltd. July 30th, 1927. (Divided application on 28,230/27.) (292,893.)

Trade Mark Applications.

THE following are among the recent applications for British trade marks. Objections against any of the proposed marks may be lodged within one month from July 11th:—

H.M., Higgs Motors (lettering and design). No. 486,815. Class 6. Dynamos and electromotors.—W. F. Higgs, trading as Higgs Motors, Witton, Birmingham.

Sico. No. 484,208. Class 8. Automatic circuit-breakers for internal combustion engines.—J. R. Hayes, Winfield, Red Down Road, Coulsdon, Surrey.

Self-Regenex. No. 488,724. Class 8. Electric accumulators and batteries.—Société l'Eclairage Portatif, Clichy, France. (British representative: S. Sokal, 1, Great James Street, W.C.1.)

Meegam. No. 489,054. Class 8. Radio-telephonic apparatus and parts thereof.—M. Saragoussi & Cie., Paris. (British representatives: Chatwin and Co., 253, Gray's Inn Road, W.C.1.)

Apex. No. 489,378. Class 8. Electric cells and batteries (not for medical purposes). Elektro-Chemische Fabrik Alfred Baehr Gesellschaft, Berlin. (British representative: D. Grabow, 19, Minster Road, N.W.2.)

"Magnatone." No. 491,397, and "Magnatone" Aerial Encircles the World (lettering and design). No. 491,398. Class 8. Aerials for use in radio-telephony. Sparklets, Ltd., Ancel Road, Upper Edmonton, N.18.

Thermalator. No. 490,146. Class 11. Electrically-heated applicators for curative and surgical purposes.—W. E. Holder, trading as the Thermalator Co., 4, Manchester Street, W.1.

Rajar. No. 486,216. Class 13. Electric lamps (ordinary), &c.—Amalgamated Photographic Manufacturers, Ltd., 5, Soho Square, W.1.

CORRECTION.—Trade Mark No. 491,702 (Benjamin Electric, Ltd.) was incorrectly given as "Vibroholder" in our issue of July 6th; the word is actually "Vibrolder."

New Work for Contractors.

Particulars of new works and building schemes for the use of electrical installation contractors in search of work and all interested in the sale of electrical and allied plant and other products.

Publication in this list is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

ASHFORD (KENT).—Sawmills, for Frank Davis & Co.

ASHTON-UNDER-LYNE.—Joint hospital, Corporation and neighbouring authorities.

BLACKBURN.—Additional 60 houses, Intack, for the T.C.; borough surveyor. School, Audley (£36,572), for the Borough E.C.; director of education.

BARNSLEY.—Elementary school, Littleworth; Education Committee. Headquarters, St. John Ambulance Brigade; Barnsley Division Committee.

BATH.—Rehousing scheme (250 flats), for the T.C.; borough surveyor.

BEBINGTON AND BROMBOROUGH.—Houses (90), for the U.D.C.; Hughes, Ltd., builders. Additional 110 houses, for the U.D.C.; surveyor.

BEXHILL.—Houses, Magdalen Road; Harrison Smith Buildings, Ltd., Magdalen Road. Houses, Cranston Avenue; E. Maynard, Collington Avenue.

BILSTON.—School, Loxdale (£11,595), for the E.C.; Perks and Gould, builders.

BIRMINGHAM.—Electric lighting, heating, &c., at mental hospital; city engineer. Reconstruction destructor works, Rotton Park (£125,000); city engineer.

BRISTOL.—Printing works, Bath Road, Totterdown, for E. Bartlett & Sons, Ltd. Twenty-four houses, St. Ann's Estate; E. A. W. Poole & Son. Reconstruction Broad Weir baths (£36,000); Noble & Son, Ltd., Newcastle.

BURSLEM.—Additions, laboratory, Rolling Mills; British Aluminium Co.

CARLISLE.—Seventy-six houses, Raffles Estate; John Laing and Son, Ltd. Twenty-six houses, Longsowerby Estate; John Topping & Son. Alterations, Caldergate, for Carr and Co., Ltd.; H. E. Scarborough, architect.

CHESTERFIELD.—School, Boythorpe (£12,500), and reconstruction, Whittington Moor School, with central heating (£8,300), for the Borough E.C.; director of education. Houses (41), for the T.C.; P. B. Houfton & Co., architects, Market Place. Houses (46), for the T.C.; W. H. Wagstaffe & Sons, architects, 73, Saltergate (returnable deposit of £1 1s. in each case).

COLCHESTER.—Warehouse, Osborne Street; W. A. Hills and Son. Theatre, St. John's Street, for E. H. Bostock and Sons; John Fairweather, architect.

COWPLAIN.—School (£15,100), for Hants. E.C.; director of education, Winchester.

CROYDON.—Ninety-one houses, Verdayne Avenue, four shops, Wickham Road, six houses, The Glade; P. Richardson.

DERBY.—Extensions to county offices, for the Derbyshire C.C. (£14,000); county architect.

DOUGLAS (I.O.M.).—100 houses, Pulrose Estate; J. E. Teare, Corporation architect.

DUMFRIES.—Additional 72 houses, Annan Road, for the T.C.; burgh surveyor. Garage, showrooms, &c., Annan Road, for E. M. Beattie & Co., motor engineers.

EDINBURGH.—Two cinemas for London Syndicate; T. Bowhill Gibson, architect. New Scottish National Library; Office of Works.

ELLESMERE PORT (CHESHIRE).—Additional 250 houses for the U.D.C.; surveyor.

GLASGOW.—Hall for Miners' Welfare Committee at Bishopbriggs; secretary, Cadder District Miners' Committee, Bishopbriggs.

GRAVESEND.—Pavilion, Milton Road; Imperial Paper Mills, Ltd.

GRIMSBY.—Fish dock; L.N.E. Railway.

HALIFAX.—Ninety-four Corporation houses, Moor End Road scheme, Section No. 1 (wiring only); borough engineer, Crossley Street, Halifax (deposit £2 2s.). Tenders by July 30th to P. Saunders, town clerk. Filtration works, Thrum Hall Lane (£24,000), and arcade and shops, Market Street (£51,000); borough engineer.

HAMPTON.—Ninety-five houses, Hillfield Estate; U.D.C. surveyor. Twenty-nine houses, Holly Bush Lane; Snelling and Sharman, Ltd. Stores, Priory Road; Watney, Combe, Reid & Co., Ltd.

HANLEY.—Additions, Etruria Pottery; Josiah Wedgwood and Sons, Ltd.

HASTINGS.—Reconstruction, White Rock Baths (£100,000), for the T.C.; S. Little, borough engineer.

HODDESDON (HERTS.).—Church, Wesleyan trustees; secretary.

IRISH FREE STATE (CORK).—Extensions to Technical Institute; D. M. O'Connor, architect.

LANARKSHIRE.—Extension of jam factory at Wishaw for Battleaxe Toffee Company; the manager.

LEEDS.—Warehouse, York Road; W. & R. Jacob & Co. (Liverpool), Ltd. Municipal washhouse; city engineer.

LIVERPOOL.—Elementary school, Leamington Road, Norris Green (deposit £2 2s.); land steward and surveyor (architect's department), municipal buildings.

LONDON (EAST HAM, E.).—Alterations, Empire Cinema, Barking Road; G. Coles.

(HACKNEY, E.).—Concert and billiard hall, Well Street; S. S. Holden. Factory, Belfast Mews; F. Dod & Co.

(HORNSEY, N.).—Electric lighting, St. Michaels School; managers.

(ISLINGTON, N.).—Central school, Hope Street; L.C.C. Education Committee.

(STOKE NEWINGTON, N.).—Factory, 92-100, Stoke Newington Road; H. Kent.

(CAMBERWELL, S.E.).—Extensions at Old Kent Road tram depôt; South Metropolitan Gas Co.

(WOOLWICH, S.E.).—Municipal offices, Wellington Street; Borough Council.

(STREATHAM, S.W.).—Elementary school, Streatham Vale (£40,000); L.C.C. architect.

MAIDENHEAD.—Block of shops, King Street, for G. Mattingley. Conversion of premises into cinema, Queen Street, for E. Dunkels.

MANCHESTER.—Reconstruction works, Oldham Road depôt; city architect.

MAYBOLE (AYRSHIRE).—Reconstruction, parish church; Rev. D. Swan.

MOTHERWELL.—Extension to Messrs. Stewart and Lloyds' Vulcan Works; the manager.

NEWCASTLE.—Shop and warehouse, Newton Road; Newcastle Co-op. Society, Ltd.

OLDHAM.—Church schools, Leesfield (£13,340); Rev. F. W. C. Woollett, vicar.

OLNEY (BUCKS.).—Boot factory, Northampton Road, for S. Cowley, Ltd.

OSSETT.—Extensions, garages and workshops, Dewsbury Road; F. Nicholls.

OXFORD.—Extensions, 61-2, George Street; Oxford Co-op. Society. Extensions, Electra Palace; Electra Palace Co. Extensions, servants' quarters, West Block, Walton Street; Somerset College trustees. Additions, Fellows' Common Room, Corpus Christi College; President and Fellows. School for girls, Headington Hill; Headington School (Oxford), Ltd. Factory extension, Botley Road; W. Baker & Co. Laundry, Harpes Road; Electric Laundry (Oxford), Ltd. Alterations, 36, St. Giles Street; Rector and Fellows of Exeter College.

PORTOBELLO.—Automatic telephone exchange; H.M. Office of Works, 122, George Street, Edinburgh.

PRESTON.—Housing scheme (38), Holme Slack Estate; W Platt, borough surveyor.

RADCLIFFE (LANCS.).—Additional 70 houses, Hollinhurst Estate, for the U.D.C.; surveyor.

REDRUTH.—Housing scheme (54), for the U.D.C.; surveyor.

ROTHERHAM.—264 houses, Herringthorpe Estate; R. Baron and Co., Ltd., Bishop Auckland. Works extensions, Meadowhall Road; Geo. Turton Platts & Co., Ltd.

SMETHWICK.—Workshops, stores, &c., Piddock Road (£16,000); borough gas engineer.

SOUTH SHIELDS.—Development building estate, King George Road; T. W. Page & Son, architects.

STRETFORD.—Works extension, Ayres Road; International Wafer Co. Offices, Trafford Park Road; Co-operative Wholesale Society, Ltd. Houses (250); U.D.C. surveyor. Senior boys' school, Old Trafford; Education Committee.

SUNDERLAND.—Phthisis pavilion, for T.C. (deposit £2 2s.); borough engineer, Town Hall.

TRURO.—Alterations, Lemon Quay; Reed Bros., Plymouth.

WAKEFIELD.—Houses (52) for the R.D.C.; Massie & Holdsworth, architects, Yorkshire Buildings, Wood Street; specifications from W. Druce, clerk to Council, 18, St. John's North; deposit £1 1s. (July 18th).

WHITCHURCH (HANTS.).—Extensions, Church schools; Alfred Cox, architect, 11-13, Southampton Row, London, W.C. (returnable deposit of £1 1s.).

WORTHING.—Extensions (430 places), High school for girls, for West Sussex E.C.; director of education. Extensions, boys' secondary school (£6,887), for West Sussex E.C.; J. Longley & Co., Ltd., builders, Crawley.